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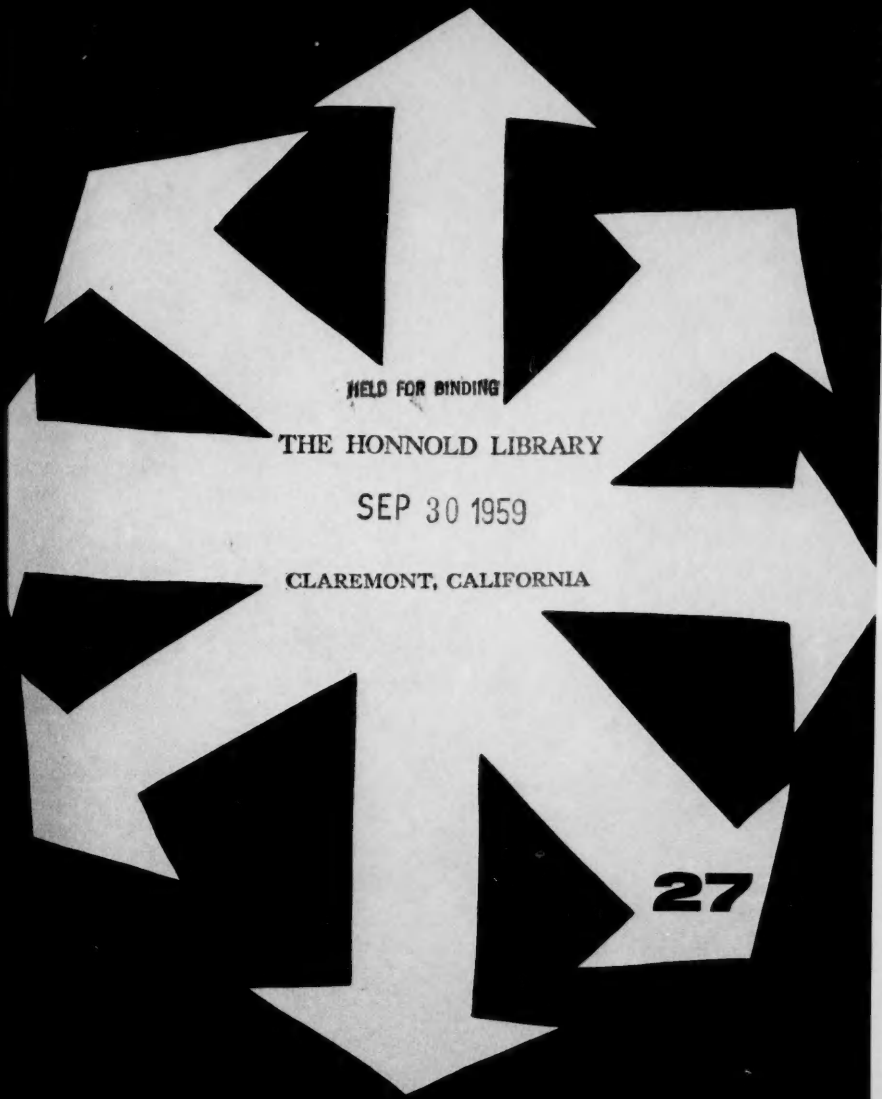

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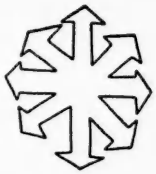

diogenes

a quarterly publication of

THE INTERNATIONAL COUNCIL FOR

PHILOSOPHY AND HUMANISTIC STUDIES

DIOGENES

The English-language edition of *Diogenes* is published quarterly in December, March, June, and September by the University of Chicago Press, 5750 Ellis Avenue, Chicago 37, Illinois. Entered as second-class matter at the Post Office at Chicago, Illinois. Editorial correspondence for the English edition should be addressed to Richard McKeon, Editor, English Edition, 5632 Blackstone Avenue, Chicago 37, Illinois.

Business correspondence should be addressed to the University of Chicago Press. All changes of address should provide both the old and the new address.

Editorial correspondence should be addressed to Roger Caillois, Editor, International Council for Philosophy and Humanistic Studies, 9, Place de Fontenoy, Paris 7^{e}, France.

Four parallel editions of the review are published simultaneously:

English: Published and distributed in the United States by the University of Chicago Press. Subscription rates for U.S.A. and possessions: 1 year, $4.00; 2 years, $7.50; 3 years, $10.50. Canada and Pan American Postal Union: 1 year, $4.50; 2 years, $8.50; 3 years, $12.00. All other countries: 1 year, $5.00; 2 years, $9.50; 3 years, $13.50. Single copies: $1.25.

French: Published by Librairie Gallimard, Paris.

Spanish: Published by Editorial Sudamericana, Buenos Aires, Argentina.

Arabian: Published by the Librairie Misr, Cairo, Egypt.

Printed in the U.S.A. at the University of Chicago Press, Chicago 37, Illinois.

DIOGENES

Number 27

Fall 1959

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Howard B. White

CIVILIZATION AND FOREIGN POLICY: A NOTE ON SOME RECENT AMERICAN LITERATURE IN THAT FIELD

In an introduction to Louis J. Halle's *Civilization and Foreign Policy,* Dean Acheson notes with approval that Halle believed a group of men, formerly members of the Policy Planning Staff of the United States State Department, to be seeking a new theory of foreign policy which would lie outside the traditional theory.[1] Halle's work, like that of the others whose names were mentioned (George F. Kennan, Paul Nitze, and C. B. Marshall), represented a serious and searching analysis of the conceptual frame of American foreign policy, a search largely accompanied by a demand for a more realistic consideration of problems of power. The members of the Policy Planning Staff were by no means the only, or even the first, Americans to question American thinking on foreign policy from the standpoint of power politics. Without going back to Alexander Hamilton, we must consider, in particular, Hans J.

1. New York: Harper, 1952, 1955.

Morgenthau and Reinhold Niebuhr.[2] This kind of thinking is still being advanced; and, more recently, the warning that Americans misunderstood the problem of power was put with some forcefulness by Robert Endicott Osgood: "More than any other great nation, America's basic predispositions and her experience in world politics encourage the dissociation of power and policy."[3] There is no doubt that work of recent years has shown the increased seriousness of American interest in the problems of foreign policy and civilization. The contribution which these and other writers have made is a very great one. Despite many differences among themselves, their trend seems to embody a certain oneness, which lies in a perception of the problems of power. Acheson points to the practical experience of the State Department group and their intention to "see life steadily and see it whole," in Matthew Arnold's famous phrase.[4] Yet, a few years after these writers, whom Acheson so highly regarded, had tried to acquaint the American people with the realities of power in foreign policy, one of them, George F. Kennan, was publicly criticized by Acheson himself for "never having understood the realities of power politics." Shortly thereafter, Acheson, in his latest book, reiterated the charge that "power politics" was, for Americans, still a derogatory term.[5] Kennan, one of our most thoughtful and sensitive writers on foreign policy, and Acheson, one of our most articulate and eloquent secretaries of state, had failed to satisfy the American people, and Kennan had failed, apparently, to satisfy Acheson regarding the significance and the reality of power politics. Yet in the light of some of the literature which has appeared since the rise of these writers, whom we may call "realists" though they do not necessarily so characterize themselves, one may question whether the danger is still that which Acheson described. One who reads Henry A. Kissinger's *Nuclear Weapons and Foreign Policy* may wonder not whether Americans understand the realities of power[6] but whether, indeed, some of them understand anything else. We face the danger that the wheel may come full circle, that a naïve idealism may be replaced by a

2. For an analysis of this trend see Kenneth W. Thompson, "The Study of International Relations," *Review of Politics*, XIV (October, 1952), pp. 433 ff.

3. *Limited War* (Chicago: University of Chicago Press, 1957), p. 29.

4. Halle, *op. cit.*, p. xvi.

5. *Power and Diplomacy* (Cambridge, Mass.: Harvard University Press, 1958), p. 30.

6. New York: Harper, 1957.

purely methodical realism, and that the very words "politics" and "strategy" may become interchangeable terms. We face that danger, but let no one suspect that Americans, in general, have succumbed to it.

The purpose of this note is to examine some of the problems raised by the new school of "realists" in American foreign policy thinking, particularly that which relates civilization and foreign policy. Indeed, Halle's title is an apt one, for it suggests that there is a necessary relation between a nation's foreign policy and the political principles which guide its domestic life. Halle sees foreign policy as a "necessary reflection of national character as it is today" and finds each civilization as representing a "particular vision of the universe and man's place in it" (pp. 27, 171). American foreign policy, then, is in some way a product of American civilization, and certain distinctly American ideas, as well as more generally Western ideas, material conditions, chance, and other causes radically affect the peculiarity of that policy. It follows, too, that the ideas of the new realists are as much related to American thought as are those of their predecessors.

To understand the new realism, one must understand something of its critique of its predecessors. This is a criticism of a moralistic perfectionism, which sees the traditional American thinking on foreign policy as demanding "a moral and emotional appeal" and calls for a concentration less on perfection than on utility.[7] It sees some of our past mistakes as coming particularly from that kind of idealism which puts its hopes in the progressive development of international law and, ultimately, in a world state. It questions Woodrow Wilson's actions in placing the idea of an international legal order above the preservation of a balance of power in Europe after World War I.[8] Its opposition to Wilsonian idealism is deep-seated, and in its own treatment of foreign policy it concentrates less on international organization than on what it considers the realities of power. Indeed, it regards the trend—wholesome and necessary—in the study of foreign policy as a trend in the direction of studying "underlying forces."[9]

7. Osgood, *op. cit.*, p. 279, and chap. ii, *passim;* Charles Burton Marshall, *The Limits of Foreign Policy* (New York, 1954), pp. 27, 54, and *passim.*

8. Osgood, *op. cit.*, pp. 97–98; George F. Kennan, *American Diplomacy 1900–1950* (Chicago: University of Chicago Press, 1951), Part I, chap. iv, *passim;* Hans J. Morgenthau, *Politics among the Nations* (2d ed., New York: Knopf, 1954), pp. 512–13.

9. Thompson, *loc. cit.*

The realist criticism, however, goes far deeper than attacking Wilsonian idealism. The thought which it criticizes, and which still persists, is part of the liberal tradition, and attack on it may be viewed as a criticism of the liberal tradition, though its exponents would not necessarily agree with this statement. Realism views the particular consequences of perfectionism as part of a peculiarly American dynamic or, in Osgood's terms, views progressive pacifism as having among Americans "a distinct sense of immediacy" (p. 32).

The realists have seen clearly the relation between idealism and ruthlessness that has developed in modern political thought. They understand that a society dedicated to perpetual peace and the establishment of a world order based on consent may fight, if it does so, with a savage and moralistic ruthlessness. They recognize the extent to which, in Acheson's words, the "moralism of an outraged pacifism" contributed to "the triumph of the belief in unlimited force."[10] They see the dangers in a *hubris* derived from progressively successful technological progress. They recognize the "irresponsible form of self-righteousness" (Osgood, p. 283) in thought and action which, in eschewing force, is compelled to become more dependent on it than it need otherwise be.[11] Since they appreciate the weakness of doctrinairism, they prefer the old world of diplomacy to the new world of unlimited goals. The restoration of that old world, insofar as it is possible at all, would demand a courageous independence of group pressures and an unwillingness to rely too heavily on public opinion.[12] It would demand the return of a certain moral consensus, which, as we have repeatedly been told, prevailed in the eighteenth and nineteenth centuries.[13] Whether or not that consensus, which belonged to a world run by fewer people, can be restored, the realists see that a less idealistic foreign policy is often a less pretentious and a less ruthless one. While the level of morality in any international consensus might not satisfy some Americans, the realists recognize that the moral consensus of a small group of diplomats

10. *Op. cit.*, p. 35; Kissinger, *op. cit.*, pp. 87 ff; Marshall, *op. cit.*, pp. 100, 104; Osgood, *op cit.*, pp. 87, 90.

11. See esp. Kennan, *Realities of American Foreign Policy* (Princeton: Princeton University Press, 1954), chap. i.

12. Kennan, *American Diplomacy, passim;* see the discussion of the problem in Kurt Riezler, *Political Decisions in Modern Society* (printed as a supplement to *Ethics,* LXIV [January, 1954], 8 ff.).

13. See, among others, Harold Nicolson, *The Evolution of Diplomatic Method* (London: Constable; New York: Macmillan, 1954), pp. 62 ff., 74 ff.; also Osgood, *op. cit.,* 81 ff.

might, and once did, avoid the dangers of the moral intransigence of an aroused public opinion. They try to guide a man's future to a world of limited expectations and, therefore, to a world of limited strife. They have, at least, some recognition that a world of limited expectations does not rest easily beside a world in which everyone is urged to think as we think or act as we act. In so doing, they become suspicious of an action based on narrowly moral considerations. They have tried, in effect, to lend support to the statement of Alexander Hamilton that "all for love and a world well lost" is not "a fundamental maxim in politics."[14]

In their opposition to doctrinairism and sentimentality, the realists have done great service indeed to American thinking on the subject of foreign policy and civilization. Yet, while the association of foreign policy and civilization may help in the understanding of the new realists, there is some doubt as to how far it helps in the understanding of foreign policy itself. The very term "civilization" is ambiguous. At one time it meant a state of society in which men had chosen to live and which was in some way superior to "natural" or "barbarian" society. When a contemporary writer speaks of civilization, however, he usually contrasts it not with an "uncivilized" state of nature but with another civilization, whereas Hobbes and Locke had clearly intended to contrast a superior "civil society" with an inferior "state of nature." The concept has progressed in vagueness in our time. Halle, it is true, does contrast "civilization" and "barbarism," and considers communism as incapable of establishing a civilization because its view of man is degrading (p. 179). Halle sees our "traditional civilization" as "civilized" because of its emphasis on "individual human dignity" (p. 167), but he also regards Hellenic times as "civilized," whereas he could hardly relate them to the concept of "individual human dignity." Since, like many of his fellow-realists, he is full of admiration for the American way of life yet deplores in part American thinking on foreign policy, there is some doubt as to whether he does ultimately relate foreign policy to civilization.

In general, we may summarize the realists' criticism by referring to Osgood's contention that Americans in particular have, in their tradition, encouraged the divorce between power and politics. Whether this is a valid thesis is extremely difficult to determine. In a way it seems to

14. *Pacificus*, No. 4, in *Works* (New York, 1851), VII, 98.

be true. We were involved in the League of Nations, but our Senate rejected it. We had nothing to do with the Holy Alliance, which Castlereagh condemned in much the same terms as the Briand-Kellogg Pact was later condemned. Woodrow Wilson had something to do with the breakdown of diplomacy, but so did Lloyd George. If John Dewey is a modern utopian, so is Karl Marx. Debates about the responsibilities of a "civilization" do not get one very far. What distinguishes one civilization from another is a body of political principles. In other words, accidents of geography, material resources, and "national character," meaningful as they are, hardly stand with what people love and hate, believe and renounce, and, at a higher level, think and know (Halle, p. 170). Thus, while it might not be difficult to prove that the "divorce between power and politics" does have important, especially American, manifestations, it is virtually impossible to prove that these manifestations are what determines the nature of the civilization. If a regime, or what is vaguely called a "civilization," is determined chiefly by its political principles, which is what West and East so often claim, the political principles themselves are common to Western modernity, and probably to all modernity (cf. Osgood, pp. 32, 81). A realist can make a serious mistake by minimizing the effect of rationality in what we call "civilization." Our common heritage, and indeed our deliberately chosen common heritage, is one of liberalism and of scientific technology. Our "civilization" must be understood in these terms, and it is in no radical sense peculiarly American—but it is peculiarly modern.

A criticism of this common heritage is, then, ultimately a criticism of the liberal tradition. Such a criticism may, and should, recognize the great goods of the tradition. It must, however, ask whether there is a meeting ground between idealism and realism in that tradition. If men cannot find such a ground or if that proves insufficient, man must seek a new way.

The new realists do not really offer a new way. They may offer a middle way, because they are, generally speaking, committed to the liberal ideals—perhaps as much as the idealists they criticize. Both Marshall (p. 30) and Halle (p. 54) regard the goals of foreign policy as easy to establish. Halle is certain that a world government which had standards similar to those of American democracy, and which upheld universal freedom, would be a good thing. That suggests that Marshall and Halle would, in effect, accept the liberal goal of the idealists they criticize and that their criticism of idealism is a criticism of means.

Osgood, too, accepts the liberal goals and says that "the great moral achievements remain where they always have been, in the realm of the cultural, political, and social conditions of existence" (p. 283). Osgood may not be so sure of progress as some of our idealists, but he still relates the "ideal world" to the "consent of the community" (p. 16). Kissinger wonders whether the nuclear age does not offer opportunities as well as risks (p. 20). Even Kennan, whose penetrating and courageous questioning of our foreign policy in his Reith lectures is so real a contribution to our thinking, finished by quoting Thoreau to the effect that "there is no ill which may not be dissipated, like the dark, if you let a stronger light in upon it."[15] Kennan's views of the American realities have been of enormous service to his countrymen, but statements of this kind represent no more than a will to believe, a will that is shared by the liberal tradition.

If the goals of foreign policy are, in fact, easy; if it is easy to know that world government, based on consent, is unalloyed good, however difficult of attainment; if the light will really dissipate the dark, then the only thing wrong with Wilsonian idealism was its choice of means. One difficulty is that the goal of a world state, as expressed for example by Halle, represents an extreme form, almost a caricature of Wilsonian aspirations, with a greater reliance on public opinion and the necessary engineering of world consent. Halle, of course, is a realist and considers this goal highly improbable within the foreseeable future. Perhaps a greater difficulty, therefore, is the dilemma caused by a commitment to realism, on the one hand, and to liberalism, on the other. This dilemma is understandable in the light of the fact that the alternatives to liberalism usually presented in our time are morally repulsive; but it is still a dilemma. It leads to a peculiar kind of double standard, with democracy as the key to domestic policy and power as the key to foreign policy, often expressed in terms of a separation of politics and morality. Seen in this way, the quarrel between idealists and realists is one between those who believe that some kind of individual morality (a morality derived from the marriage of Christianity and liberalism—of doubtful legality, since at least one of the partners was under age) should be a standard for national and international conduct and those who believe that it cannot be. The latter, accepting the morality itself, are obliged to accept a double standard as a human necessity, a standard which sees

15. *Russia, the Atom, and the West* (New York: Harper, 1957, 1958), p. 99.

political life as less moral than private life. They are compelled to insist that there is an unbridgeable gap between politics and morality.[16] One can readily understand the urgency which compelled Niebuhr and others to deplore excessive moralism in our thinking about foreign policy and to suggest that there is a more moral life than the political life—the life of a Christian saint.[17] Jeanne d'Arc was, however, canonized, and we may wonder whether there is not something wrong with the morality that is at tension with politics. Anyone who accepts the very real insight offered by the realist criticism may have to live with this double standard unless he can discover a morality that is not apolitical. To find that morality, he would have first to go back to liberalism and the common roots of realists and idealists. It is widely recognized in the United States that the early American statesmen were wiser than most of those who have come since, and closer to political reality. That view is shared by Kennan and seems to be shared by others of these writers as well.[18] These early American statesmen belonged to a liberal tradition stemming from Hobbes but acknowledging, more freely, its debt to Locke. Hobbes and Locke might, of course, be called realists, but we have to ask in what sense they were realists. They looked to find the meaning of man in a state of nature, a state where life is bestial and where the inconveniences are very great indeed. In Hobbes's state of nature, where each man seeks to preserve himself, he seeks also to exercise power over others, or at least enough men do so to render self-preservation precarious. In such a state destructiveness travels apace, and the object of civil society is determined by the vanity and violence of the state of nature. Its object is necessarily peace. Morality itself is identified by Hobbes with the fear of violent death and therefore with the growth of peaceful pursuits and habits. Those peaceful habits are developed, however, within civil society itself. Sovereign and warring nations are, on the contrary, in a state of nature.

While this is generally accepted as Hobbes's view, it is less widely conceded as far as Locke is concerned. Locke's statement: "Principles of action indeed are lodged in men's appetites; but these are so far from

16. See esp. Reinhold Niebuhr, *Moral Man and Immoral Society* (New York: Scribner's, 1932, 1946); *Christianity and Power Politics* (New York, 1940), esp. chap. i; Hans J. Morgenthau, *Scientific Man versus Power Politics* (Chicago: University of Chicago Press, 1946), chap. vii; Thompson, *loc. cit.*, Kennan, *Realities*, p. 49.

17. *Christianity and Power Politics*, p. 23.

18. *Realities*, p. 3; cf. Marshall, *op. cit.*, pp. 41, 42, 53, 54; Halle, *op. cit.*, pp. 22–23.

being innate moral principles, that if they were left to their full swing they would carry men to the overturning of all morality"[19] must, however, lead us to conclude that he denies natural morality as strongly as Hobbes and that his view of human nature has much in common with that of Hobbes. His state of nature is, like Hobbes's, a state of war.[20] Where Locke differs from Hobbes is in his regarding absolute monarchy as retaining and even magnifying the inconveniences of the state of nature, where a man is a judge in his own case (though, in absolute monarchy, not each man) and therefore, implicitly, in a state of war.[21] For Locke as well as for Hobbes and more explicitly, all "princes and rulers of independent governments . . . are in a state of nature."[22] In a state of nature, power is unchecked. Hence it is clear that the idea of power, so significant in the writings of our new realists, is at the root of Locke's thinking regarding foreign policy, for it is only in civil society, and by means of constitutional law, that the desire for power is reliably restrained. And it is that civil society which directs the love of power to peaceful pursuits (i.e., private well-being) which most completely fulfils the teaching of both men. It is no accident that the idea of the "pursuit of happiness," so important to Jefferson, is found in the chapter on "The Idea of Power" in Locke's *Essay concerning Human Understanding*. Here our realists, who generally accept the modern goals of technological advancement and the more abundant life, are as idealistic as our idealists.

The founders of modern liberalism, fully aware of the realities of power, hoped, with the establishment of civil society, for peace. Would peace not also be their goal for all the world as well as for any independent civil society? Some, at least, of their critics saw it that way. Rousseau denied that any philosopher had succeeded in recapturing the state of nature, though all of them had tried.[23] He himself, however, claimed to have achieved that state. He saw natural man as an animal.[24]

19. *Essay on Human Understanding*, Vol. I, chap. ii, par. 13.

20. See Leo Strauss, *Natural Right and History* (Chicago: University of Chicago Press, 1953), p. 225, and the citations from Locke therein.

21. *Treatises of Civil Government*, II, 90.

22. *Ibid.*, II, 14.

23. *Discours sur l'origine de l'inégalité parmi les hommes* in *Œuvres* (Paris, 1823), I, 224.

24. *Ibid.*, pp. 227 ff.

While the philosopher might find his way back to the state of nature, in speech and in understanding, society could never return to its animalism. The self-love which distinguished man's animal existence was replaced by other attachments. Indeed, Rousseau says: "Le plus méchant des hommes est celui qui s'isole le plus, qui concentre le plus son coeur en lui-même; le meilleur est celui qui partage également ses affections à tous ses semblables."[25] The true civil society would be established through an extension of the passion of love: from self-love to love of another person, from love of another person to love of country, from love of country to love of humanity. How far Rousseau himself would have gone toward perpetual peace is an open question.[26] Certainly, however, it is on the basis of Rousseau's criticism of the state of nature of his predecessors that Kant wrote his essay on perpetual peace. Any full treatment of the affinity of realism and idealism would require a systematic analysis of Kant's text and an answer to the question of how far it is a necessary inference from the principles of Hobbes. That task cannot be attempted here. I can only comment briefly on the relation of power and peace, of realism and idealism, in the liberal tradition.

Like Hobbes and Locke, Kant saw the world of independent nations as a state of war.[27] He denied, however, that these nations are in a state of nature, because of the modification of original nature by constitutional law within them.[28] If independent nations are in a state of war, it follows that any treaty of peace dictated by victory, lethargy, expediency, or some other temporary condition is not really worthy of the name "peace." If, however, they are not in the state of nature but have risen above their original state, reason ought to persuade men of their duty to peace, and the same compulsion which made men, in a state of nature, submit to constitutional law ought to unify nations under a world law.[29] What they ought to do, however, they will not necessarily do, and "nature" must direct them to perpetual peace. Once you have said, as Rousseau did, that man is by nature an animal, which he cannot again become, you have suggested that nature has, in some way, a progressive meaning, related to history. In that case, just as man was

25. *Lettre à M. d'Alembert,* in *Œuvres,* II, 164–65.

26. *Œuvres,* V, 413 ff.

27. *Eternal Peace,* Sec. II.

28. *Ibid.,* second definitive article and comment.

29. *Ibid.,* First Addition.

graduated from animalism to civil society, warring nations may be graduated from animalism to world federation. Of critical importance in this graduation is the development of property and of commerce, and Kant suggested that all nations would sooner or later fall under the spell of commerce, and he followed Montesquieu in regarding the spirit of commerce as pacific.[30] Neither Montesquieu nor Kant indulged in sentimental visions of the nobility of commerce. The foundations of its peaceful spirit are in the selfishness of man, and Montesquieu regarded the spirit of commerce as a kind of mean between virtue and brigandage.

Admittedly, one does a certain violence to Kant's analysis by concentrating simply on the apparently utopian character of his conclusion; but my problem is that, unless the liberal tradition accepts the utopian alternative, it seems to be at the mercy of an ambiguity between peace, as the great goal of civil society, and power, the negation of peace, as the frame of international relations. Leo Strauss points out that Hobbes "destroyed the moral basis of national defense. . . . The only solution to the difficulty which preserves the spirit of Hobbes' political philosophy," he adds, "is the outlawry of war or the establishment of a world state."[31] That the idealistic solution was implicit in their very realism was recognized by some of the founders of modern thought. Giordano Bruno contrasts the way of the "new Typhons" (Columbus and those who followed him), who disturbed the peace of others, with that of the Nolan, whose science would free the mind and, by implication, bring peace.[32] Francis Bacon supports imperialism, but his own best regime is the peaceful society of Bensalem, which exists for many warless centuries. It is easy for us today to say that these philosophers miscalculated. I can only mention briefly here two of the unfulfilled expectations of Bacon—one of the founders of modern thought. Bacon believed that it would be possible to found a kind of civil religion to replace Christianity—a religion of rational hedonism, constructed out of an alliance of old, paternal power and young, vigorous science. What is perhaps even more important, he believed that, while modern science would have to give rise to the expert, he had found a formula to make the expert subordinate to the philosopher. In other words, books on strategy would

30. Cf. *ibid.*, First Addition, p. 3, with *De l'Esprit des Lois*, XX, 1.

31. *Op. cit.*, pp. 197–98.

32. *La Cena de le Ceneri*, in *Opere Italiene* (Gentile ed.; Bari, 1927), I, 24–25.

be written by the Xenophons and the Machiavellis, or by those under their control, and strategy would be, not politics, but a very minor part of it.[33]

Should that have happened, it is doubtful that the problem of power, important as it was to Bacon, and even more so to Hobbes,[34] would have achieved its present proportions among the new realists. The idea of power became a substitute for the idea of rule. Power differs from rule not only in that it suggests potentiality rather than actuality but also in that it claims no moral justification in nature. Rule implies a certain kind of superiority, not necessarily the coincidence of natural and conventional superiority. The idea of power rises with the idea that man can do what he wants to do. In order to make sure that what man wants to do is not oppressive, men have distinguished between the power of man over nature and the power of man over man. However that may be, modern ideas of power find their fruit in modern technology. Technological advancement is, obviously, part of the modern world, and it relates, in a strange way, realists who want to make power the basis of our thinking and idealists who hope for a warless world, distinguishing the power of man over nature from the power of man over man. Both these groups depend rather on power than on rule, and that means that they must abandon ultimately the conditioning of our thought by any *telos* (end or final cause). Both Marshall and Kissinger attack what they call the "quest for certainty" in our thinking about foreign policy.[35] While their meaning is not absolutely clear to me, the quest for certainty, in the sense of the end, did not lead to modern technological advancement and the teaching regarding power which conditioned it. Modern philosophy, in its concentration on building a better world, believed that possible precisely because the world about man was held to be alien and incomprehensible. In other words, it hoped to use power for peace and plenty precisely because it abandoned the quest for certainty, as Bacon made clear when he said

33. I have tried to prove this in a recently completed study of Bacon's political philosophy.

34. *Leviathan*, chap. x.

35. Marshall, *op. cit.*, p. 106; Kissinger, *op. cit.*, pp. 189, 424. Kissinger associates the quest for certainty with American empiricism. Since that quest was attacked by John Dewey also, its relation to American empiricism is not quite so simple as Kissinger suggests.

that final causes could be found for only political things.[36] If, as many of our realists have seen, terror has some of its roots in idealism, it is necessary to go a step further and see that idealism has its roots in materialism. The paradise may be near or far, but it is still a hedonists' paradise.

If we cannot altogether divorce "power politics" from the intellectual tradition that gave it birth, neither can we divorce the new technology from that same heritage. "The dilemma of nuclear war is with us," says Kissinger, "not by choice, but because of the facts of modern technology" (p. 175). The facts of modern technology, however, are with us by choice, and if the dilemma of nuclear war was not foreknown at the time the choice was made, it was implicit. Marshall puts the problem cogently: "Because this is an age of mass production, it is also an age of mass destruction. The scope and destructiveness of modern weapons are the product of—and under the logic of war an essential accompaniment of—the conditions and technics of industrial progress" (p. 63). Even in the peaceful utopia of the New Atlantis there were engines of ever greater violence and fires that time could not quench.[37] It seems to me that Marshall poses the alternatives. The logic of modern war is the logic of technological progress. Man may devise means, as often and as wisely as he can, to prevent the worst possible consequences. But the alliance between mass production and mass destruction can be permanently voided only by a warless civilization or by a civilization which does not worship technological progress. The first does not seem to be within human possibility. The second will be extremely difficult. Its importance, however, is seen by some of our new realists, notably by George F. Kennan. Kennan asks for a new social philosophy which "will have to take account of the fact that the satisfying of man's material needs is only the beginning, and does not answer, but only opens up for the first time in all their real complexity and difficulty, the crucial questions as to what environmental conditions are most favorable to man's individual enjoyment of the experience of life and to the dignity of his relationship with other men."[38]

36. *De sapientia veterum*, 26 ("Prometheus"), in *Works* (London, 1861), XIII, 44; Compare *Novum organum*, Book I, par. 48.

37. Bacon, *Works*, V, 408.

38. "Commencement, 1955," *Social Research*, XXII (Summer, 1955), 136.

One must, perhaps, go farther than that, and say that the common modern ideology, common to realists and idealists, capitalists and communists, West and East, which teaches the right of all men to the infinite benevolence of a science devoted to material welfare, is wrong. It is not wrong because we begrudge any man bread, wine, or penicillin. It is not wrong because we are indifferent to poverty and distress. It is wrong because there are principles that are at once loftier and less pretentious than those it holds. These are the principles of the "new philosophy" which Kennan seeks. Actually it is a very old philosophy, and what Kennan wants can be found, and as far as I know can only be found, in classical political philosophy. To say that is not to say that modern man can return to the ancient polis or that we can learn nothing about foreign policy from modern philosophy or history. It is rather to say that the way Plato and Aristotle looked at politics may furnish us with the critique with which to appraise both realism and idealism in foreign policy. Unless such a critique is in some measure possible, it is hard to believe that there will be any relation between civilization and foreign policy which the ordinary person can identify.

There are many respects in which classical political thought may furnish us with the critique that we need. I shall speak briefly of four. The first is that it does not regard technological advancement as autonomous. There is a technological paradise in Plato's *Critias*—the island of Atlantis, graced with plenty and eventually cursed with *hubris*. It is destroyed after Zeus calls together the gods to decree its chastisement. Its *hubris* brought its destruction, the destruction which men who pretend to be gods must expect. When Bacon declared that men could imitate the thunderbolt, he stated in effect that *hubris* could go unpunished.[39] Plato scolded Egypt for turning the study of numbers into the study of gain; the use of a beautiful pursuit dedicated to wisdom, for mundane ends.[40] It is not easy for us to accept this indictment. Indeed, our problem is no longer whether we should have scientific expansion for what Bacon frequently calls "the relief of man's estate," but how that advancement should be regulated. For better or for worse, modern man made the decision that penicillin was worth a bomb and freedom from want was worth a jet. Any solution, however, that supplies penicillin without bombs would depend on a carefully regulated

39. *Redargutio philosophiarum*, in *Works*, VII, 93.

40. *Laws* 747 C 3 ff.

technology, in which the autonomous right of the scientist to decide between penicillin and bombs would be rigidly controlled. Such controls will not be easy; they will not always be salutary. I am not saying that political power has any claim to make such decisions and to impose such controls. Someone, however, must make these decisions. Modern thought, concentrating on method, gave rise to the master of method, the expert. Modern science makes the expert necessary, for modern science depends so much on shared experience and collective research. The expert, however, disregards the ends, and, as Kurt Riezler pointed out, "there are no experts for ends."[41] Classical political philosophy would seek a means to subordinate the expert and enlist his service in the cause of those who are concerned with ends.

The pretentiousness of the technological utopia, however, goes beyond that and includes a propensity for making grandiose decisions that increase the dependence on chance and necessity and narrow the realm of choice. To Plato and Aristotle the polis is a community in the sense in which no world government can possibly be a community, and the fact that the polis is a community is one reason for regarding morality and politics as undivided. World government, on the contrary, would be not only unlikely but also tyrannical. Because of its dependence on modern communication and transportation, on atomization, on wholly impersonal class alignments, it would be unable to depend, as did the polis at its best, on friendship. World government would, moreover, move farther in the direction in which both East and West have been moving, where the righting of any wrong, not to say error, becomes more and more unlikely. It would defy the recurrence of humane things and, even under a democracy, would tend to identify what we have with what is good, to a greater extent, perhaps, than was previously done. How that differs in word and deed from the testimony of Socrates is well known.

The fundamental reason for the relatively modest expectations of classical thought was precisely the quest for certainty that positivists deplore. Men who seek something beyond and above man, of which man stands in awe, do not go around imitating thunderbolts. Men who regard reverence itself as ideological and power as the ultimate reality may certainly do so. That brings me to my second general statement:

41. "On the Psychology of Modern Revolution," *Social Research*, September, 1943, p. 328.

classical political philosophy is at tension with ideology. It is well-known that what we call ideological warfare did not always exist but is a fruit of the modern mass society and certain modern political philosophers. Edmund Burke discussed it in his time as something quite new. The conviction that either democracy or communism is a goal to which all men must eventually subscribe is widely held in the modern world, and it is passionately embraced. The passion with which it is held is related to the dogmatic skepticism of the schools, for it is no accident that citizens hold with increasing fervor doctrines which the schools consider incapable of scientific proof. Precisely because all thought is held to be historically conditioned or because the underlying reality is power and not principle, men must be granted the right to hold the most erroneous and the most unjust notions and strive for them, though the world go down in flames. The answer to this is not suppression. The answer is to find a better yardstick for "ideologies" than dogmatic skepticism.

Plato and Aristotle regarded neither Athens nor Sparta as the best regime. The *Laws* is a dialogue in which the Athenian introduces, surreptitiously and in friendly discussion, certain institutions of pre-Marathon Athens into the Dorian Laws of Crete. The best legislator is the one who puts down class strife and creates harmony.[42] Class war abounds in Thucydides but has no justification in principle. Differences between one regime and another and between one philosophic teaching and another were very great, but on the level of common opinion the object of law and the object of speech were to create a harmony in the regard for noble objects, and that is what Socrates is supposed to have done through benevolent controversy.[43] Benevolent controversy may cease to be benevolent if it can issue not in truth but only in ideology. Modern relativism has not issued in toleration.

It may be true, and it seems to be true, that that which regimes honor all over the world reaches a certain sameness. One may find in this a kind of moral censensus, not that of the Western diplomatic tradition but rather a mass moral consensus. "Mass communication of ideas from one culture to another," says Marshall (p. 64), "has drawn the world more closely together." Marshall grants that it has also sharpened the differences. Halle, on the contrary, insists that a nation which has "ex-

42. *Laws* 627 D 9 ff., 689 D, 711 B ff.

43. Xenophon *Memorabilia* IV. vi. 15.

tensive dealings with independent foreign peoples . . . must cultivate a tolerant habit of mind" (p. 112). Mass public opinion means, in a certain sense, that all nations have such dealings, though not necessarily commercial ones. One can, of course, see a certain kind of consensus on the level of popular entertainment. Kennan points out that there will be no serious international repercussions if Europe rejects our automobiles, soft drinks, moving pictures, and comic books.[44] He is right, of course; but there is some evidence that Europe, and indeed the world, are not making any such rejection. One can say that this popular communication has its common ground because there is a meeting ground in ideas. Osgood (p. 47) and Halle (pp. 124–25), men who deplore Communist tyranny, question whether the Marxist goals may not be "idealistic." I myself think that Marxist ends are hedonistic and based on a shallow materialism. At the same time, while liberal goals are certainly loftier, they share a similar attachment to the absolute value of well-being and the emulation of prosperity. This kind of consensus is, as I pointed out previously, the most widespread kind of ideology. It may still perform a service in keeping the peace. The difficulty is that it is unreliable. As long as one nation is more prosperous than another —and that seems likely to be the case—consensus may turn to envy and strife may ensue precisely because there is agreement as to the goals.

There is some doubt as to whether, on the basis of such a consensus, there can be any limitation upon warfare. Some writers, despairing like all decent men before absolute war with modern weapons, have tried to find a solution in a strategy of limited war (Osgood and Kissinger, *passim*). This means both localizing the war and limiting the weapons. The problem has been raised, however, as to just how limited this proposed limited war strategy really is. Limitation does not mean here the preclusion of all nuclear weapons but only of the biggest, directed against non-military targets. This concept has been criticized, both by Acheson and by Kennan, on the ground that tactical atomic weapons could result only in catastrophe in the areas in which they were used, however saving they might be to the United States and to the Soviet Union.[45] Granting that thinking in terms of limitation runs in the right direction, Kennan urges: "Let us by all means think for once not

44. *Russia, the Atom, and the West,* pp. 103–4.

45. Acheson, *Power and Diplomacy,* pp. 98 ff; Kennan, *Russia, the Atom, and the West,* pp. 56 ff.

just in the mathematics of destruction" (p. 58). I cannot judge the technical issues involved here; I can say only that what Kennan said badly needed saying. I can also say that there are factors other than weapons, targets, and so on which may contribute to the limitations. One of these factors is the abandonment of ideological warfare, on the ground that there are higher political principles than history happens to have accorded to one side or the other. I have no quarrel with Western civilization, but it is at its best when it is humane and unpretentious. Unless, however, we can be convinced that there may be even better regimes than the one we have (though certainly not communism), any possible limitations on warfare remain subject to unlimited politics, the kind of politics classical thought once taught us to eschew.

A third way in which classical political thought may help us is seen in the fact that it found no substitute for statesmanship. To some extent that may be said of the modern tradition as well, for, while docrinairism might have grown from Locke to Kant, diplomats continued to depend on prudence and discretion. Gradually, however, there has been a tendency to depend less on prudence and more on constitutional law. When the realists criticize political moralism, this development is one of the things they have in mind, for we tend to think of law as being more moral than diplomacy or statesmanship. If we go back to the classics, however, we go back to a morality that is not apolitical. Plato and Aristotle did not divorce politics from morality, and they were not pacifist perfectionists. The trouble with statements about the tension of politics and morality is that the realists who make them are likely to share the moral principles of the idealists they criticize. I think that the morality of Plato and Aristotle was better and therefore did not have to be divorced from politics.

Political life is, generally speaking, more moral than private life, in the sense that it offers a greater opportunity for moral action. That moral action is not directed toward self-fulfilment or abundance or longevity—or no more than marginally so. It is directed toward the highest excellence of which each of us is capable. Private morality, however, is directed toward the excellence of one's self and those for whom one is responsible, whereas public morality is directed toward the excellence of many. The just judge who preserves humanity by his leniency and obedience to the law by his severity is even more moral than the father who does the same with his children, because more

peoples are helped and man is compelled to face more risks prudently. Of course, there is a greater ruthlessness, but the courageous acceptance of that ruthlessness is certainly not immoral. There is even more ruthlessness in the case of the statesman who is compelled to take his people to war. It takes a lofty morality to recognize that necessity and to act firmly upon it. What is immoral is to tie the hands of the statesman so that a just war can no longer be waged, and that is what we have almost done. There is, it may be true, some element of doubtful morality in the ambition of just men. The rule of the reluctant is possible, generally speaking, only in the small community. Men who seek power because they are sure they are suited for it run the risk of pretentiousness. Men who seek power whether they are suited for it or not are frivolous. But there is no compulsion on the part of every political man to be either presumptuous or frivolous. That is merely another way of saying that greatness, even real statesmanship, is rare and that very few people have the loftiest political morality.

Because of the rarity of statesmanship, political science seeks, or once sought, to narrow the area of discretion. It therefore imposes constitutional restrictions wherever possible, but restrictions that may not prevent the future from acting. The statesman abstains from making those decisions that throw away the future—like the atomic bomb or world government. He understands that politics involves, in its most important aspects, "the total human situation."[46] What is demanded of the political life, particularly in foreign policy, where the law goes so little of the way, is the capacity not only for making political decisions but for permitting coming generations to make decisions as well. The statesman who will not put the well-being and, even more, the virtue of his grandchildren at the risk of chance and necessity has understood, as the classics did, the loftiness of political morality.

The fourth way in which the classics could aid us, and the last one I shall discuss, relates to the fact that classical political philosophy regarded virtue as more important than consent. I must confine myself here chiefly to one problem, that of the just war. Through many modern generations it was possible to say that a war might be partly just on both sides, and such a claim tended to minimize the ruthlessness and emphasize justice in the conduct of war. Some kind of working

46. See Kurt Riezler, *Political Decisions in Modern Society*, printed as a supplement to *Ethics*, Vol. LXIV (January, 1954).

compromise between the idea of just causes of war and the idea of just conduct on both sides made it possible for nations occasionally to follow the celebrated recommendation of Montesquieu: "Les diverses nations doivent se faire, dans la paix, le plus de bien, et, dans la guerre, le moins de mal qu'il est possible, sans nuire à leurs véritables intérêts."[47] This demand often coincided, however, with a search for the objective criteria by which a just war might be distinguished from an unjust war. Today we run the risk that the very idea of the just war may be discarded. Chapter vii of the Charter of the United Nations permits the Security Council to determine threat to the peace, breach of peace, or an act of aggression (Art. 39) and to take action, including action by armed force (Art. 42). Here the just war is defined in principle by the consensus on the Security Council, and that comes close to meaning the five permanent members. If there is ever some state so unhappy as to arouse the wrath of all five, it may be thrice-armed with the justice of its quarrel and nonetheless condemned by the body which "peace-loving nations" have chosen to guide them. That may be unlikely. As is well known, whatever consensus exists in our world, it does not usually include agreement as to the legitimacy of the immediate objectives of liberalism and communism. However, in the abandonment of any search for the objective criteria for a just war, consensus is still the standard. That a war which a voting majority conceives to be just is not necessarily just goes without saying.

Failing consensus, containment operates as a kind of limited or partial consensus. "Containment," says Osgood, "is directly and immediately concerned with achieving a particular configuration of power; not with punishing aggression or vindicating universal principles of justice and law" (p. 143). Americans are all familiar with the need for such a policy. Yet it tends to obliterate the problem of the just war. We are not permitted to demand that the just war depend on a certain configuration of power or even on the limited consensus of the free world. We are hard on reaching the point where a just war, to modern man, is a war he can win. Politicians have often acted in that way, but the alliance between politicians and scholars is almost brand new. As many of our new realists have pointed out, the policy of containment, and, more particularly, the policy of rollbacks, differ from the configuration of balance of power in that they rest not on national, and

47. *De l'Esprit des Lois*, I, 3.

therefore limited, interest but on a fixed universal alliance and unlimited interest.

The classics, which sought objective criteria for justice, would oppose, in principle, the identification of justice with partisanship. I have already noted that the just course in civil conflict, according to the classics, is usually arbitration. When arbitration fails, an injustice may have to be righted. Should that be so, there is no real reason why it should involve global war. Kennan sees the problem clearly when he expresses his hope that peace is not indivisible, as applied to the Middle East.[48] A war begun to rectify a boundary may conceivably be a just war. Ideological intervention may turn it into an unjust war—and an inhumane global war.

The problem is well and wisely treated in Shakespeare's *Henry V*. When the king appears, unknown before his soldiers, he says that he could die contented in the king's company, because the king's cause is just and his quarrel honorable. He is faced with the answer that this is more than the soldiers know or should seek to know, the soldiers believing that the question of justice is up to the king.[49] Can the soldiers of today leave the question of justice to the Charter, or to the consensus of the free world? However far we have moved toward democracy, decisions are still made by the few and the soldier may still say: "If his cause be wrong, our obedience to the king wipes the crime of it out of us."[50] The just war is still a just war, and the responsibility of statesmanship is more terrifying than ever.

There is, indeed, another way in which *Henry V* indicates our difficulty. In Chester D. Wilmot's *Struggle for Europe,* he says that a British paratroop general in Flanders on D-Day was heard to quote from *Henry V:* "And gentlemen in England, and abed, / Will think themselves accursed they were not here."

If I may venture a prophecy, no one on a nuclear battlefront, whether strategic or tactical weapons are employed, before or after the struggle, will ever again quote those lines. At least, I hope that foreign policy is not so uncivilized.

48. *Russia, the Atom, and the West,* pp. 78–79.

49. *Henry V,* Act IV, scene 1, lines 125 ff.

50. *Ibid.,* lines 133–35.

Ignacio Olagüe

CONTEMPORARY GEOPOLITICS AND THE GEOGRAPHICAL FRAMEWORK

During the first half of the twentieth century geographers analyzed at length the individual's relationship with his natural environment. The French school of humanist geography must be credited with stressing the influence of environment which, in proportion to its pronounced characteristics, becomes more and more powerful. Thus we came to understand the causes which determine a way of life, the customs, psychology, and idiosyncracies of those who inhabit the mountains, plains, forests, deserts, or seas. Our task has been a more daring one: we have studied the relationships established in the past between a certain geographical environment and the civilizations which formerly flourished there. In recognition of their meaning we labeled these relationships "geopolitics." The term, coined by the German school, enjoyed a tremendous vogue because it was so apt. However, as critics have amply demonstrated, of and by itself it was really meaningless because the subject matter with which it must be concerned belonged to other, previously established and independent disciplines, such as economics

Translated by Elaine P. Halperin.

or political geography. An inexact term, the word "geopolitics" crept into our present-day language. We, however, have chosen it to designate a determinate historical relationship.

The civilizations which, in earlier times, succeeded one another over a vast region of the earth were always distinctive because of certain conceptions that were peculiar to them. Among these many civilizations, it is easy to isolate a small number that were dynamic in nature and endowed with attributes which, together with their geographical setting, produced decisive relationships in the social realm. We shall cite one example to make this clearer.

THE GEOGRAPHICAL SETTING

When the period of Spanish colonization ended, there were almost fifty million horned animals roaming freely over the plains of South America. At that time it proved impossible to exploit this wealth. The "gaucho," who was inclined to be greedy, selected for his lunch a cow with calf from among the herd, killed it, ate the unborn calf and left the remainder to the vultures. Rio de la Plata's viceroyalty was one of the poorest in Spanish America; Buenos Aires was a very small city.

THE "IDÉE-FORCE"

In 1820, inspired by concepts of the principles of chemistry which had been studied at length during the two previous centuries, Jean Leslie (1766–1852) of the University of Edinburgh hit upon the idea of "making nature work" in a special way by forcing it to produce cold. Thus he achieved the conversion of water into ice. His experiment met with resounding success, and little by little during the course of the nineteenth century it was perfected in the laboratory. Between 1890 and 1900 a refrigeration industry was set up which soon produced results.

THE GEOPOLITICAL RELATIONSHIP

Thereafter society had to play its role. Businessmen soon realized the profits that could be made if they could send to Europe the frozen meats obtained from the gigantic herds of the pampas. Powerful companies were organized, and the features of this region began to alter. Whereas until then animals had been free to follow the caprices of nature, cattle-breeding now became an industry. Properties were sub-

divided by barbed wire, pits were dug, enormous cow sheds were built, trees were planted near houses, and systems of communication were improved. Within fifty years Buenos Aires was transformed into a city of more than four million inhabitants.

The advent of some technical idea is not enough to establish a geopolitical relationship. Such an idea must possess a particular attribute and a force that is sufficiently powerful to impel man to initiate a modification of his geographical environment. At the beginning of historical activity and for a long time thereafter a natural landscape slowly became transformed into an artificial one. But, in the course of time, artificial landscapes succeeded one another. This is so true that today the geographer is obliged to travel to the most remote corners of the planet in order to discover and enjoy a truly natural scene.

Furthermore, it seems obvious that to become really widespread, an idea must be representative of an entire culture. Leslie's successful laboratory experiment in producing cold could not therefore have originated independently in his imagination, granting, even, that genius accompanied him. This experiment, which today seems quite simple, was at that time the result of a scientific effort inspired by the multiple discoveries of the seventeenth and eighteenth centuries. Thus, the *idée-force* was characteristic of a society; and since the geopolitical relationship, by virtue of its abstract quality, was applied fruitfully in time and space, it was legitimate to conclude that every civilization of the past had had its own geopolitical relationship.

A corollary presented itself, however, in the form of an inexorable deduction. Should not our epoch also be distinctive thanks to determinate geopolitical relationships? If it were possible to isolate them plainly, would not the analysis of these relationships lead to a better understanding of our present-day society, which is so complex and revolutionized? This seems altogether possible. But, in order to perceive the influence of geopolitics upon the contemporary world, one must understand its historical evolution and thus be in a position to clearly fix the exact and decisive stage of its relationship today. For this relationship, because it is based on an *idée-force,* has been subjected to the consequences of a transformation in thought, society, and civilization. And, on the other hand, the pillar of the structure, which rests on the geographical environment, has been further subjected to natural contingencies which can modify it and whose atmospheric variations are

of the greatest importance. Consequently, the evolution of the geopolitical relationship proceeds either through the *gea* (earth) or through the idea. In the first instance, the landscape changed because of a modification in the climate;[1] in the second, the agency was a new scientific concept, the perfecting of a technique—in short, the general evolution of the civilization in question.

1. The transformation of arid or semi-desert regions into irrigated lands was the consequence of a geopolitical relationship that depended on a change in the climate. However, a geographical setting eroded by aridity must once have possessed some favorable geophysical factors: a peneplain or a riverbank situated on a lower level and downstream from a narrow inlet or a natural river bed—something that obstructed the flow of water.

On the other hand, the society under scrutiny must itself have been distinctive for its knowledge of geometry, which was indispensable in order to construct a wall and water mains for the free flow of water through dry lands. The relationship between the mathematical idea and the *gea* thus led to a transformation of the countryside, to the production of new wealth, to a renewal of life, and perhaps to the birth of a culture. But the decisive effect of such a vast undertaking was conditioned by the advent of an aridity which destroyed an earlier flourishing agricultural structure. Today, to be sure, thanks to our modern technology a desert can be converted into a garden; in ancient times such a radical, artificial change in the geographical environment was impossible to achieve except in very special cases—such as Egypt, for example. Given the rudimentary means of earlier days, it was not feasible to undertake work on such a large scale or to concentrate large masses of people with the rapidity that such operations require. Consequently, in the past the transformation of the countryside through the agency of this relationship was accomplished very slowly. During the Roman epoch Andalusia was adequately irrigated and therefore no one dreamed of building large dams; but from the thirteenth century on it became progressively drier, and a good deal of construction was begun and is still going on.

1. We have done lengthy research in the evolution of climate in history, studying in particular the crisis the Iberian peninsula experienced during the sixteenth century. See specifically *La decadencia espanola,* Vol. IV (Madrid: Editorial Mayfe); *El paisaje machego en tiempos de Cervantes: Anales Cervantinos* (Madrid, 1953). There are résumés in French in our *Historie d'Espagne* (Éditions de Paris, 1958).

2. The geopolitical relationship can also become modified owing to the advent of a fruitful principle. The industrial revolution is a striking example of this. In ancient times metallurgy always depended on the following trilogy: the *idea:* the art of building a furnace that would provide sufficient heat to melt cassiterites, pyrites, iron ore, etc.; the *"gea":* a region where these deposits were to be found, specifically in the proximity of forests that were vast enough to supply large quantities of charcoal—the only fuel that was known at that time; and the *relationship:* the copper, bronze, and iron civilizations. In our own times this relationship developed amply in certain regions. Andalusia, which possessed a very important metallurgical industry, lost it at the end of the Roman Empire because of the effects of its climate. The crisis, which was caused by a decrease in rainfall, denuded the forests of their large trees. Much later the industry moved to the north of the peninsula, on the Cantabrian coast where the streams flow down from a short range of mountains overhanging the sea; this range abounds in iron mines and is covered with imposing clumps of beech and chestnut trees. The waterfalls, which can easily be harnessed, set in motion the machinery necessary for the production and conversion of steel. In 1713 an English clergyman discovered that anthracite could be treated and transformed in such a way that it was more profitable to use than charcoal. This substitute was coke. The old magic circle—iron, forests, streams—was broken. Thus the metallurgical industry moved toward regions that lent themselves to the application of the new process; moreover, the British coal fields happened to be near the ocean, which was very convenient from the standpoint of transportation. The industrial revolution had begun.

We can now readily understand the involvement of this geopolitical relationship in the evolution of modern times.

During the period of the Napoleonic wars England alone produced more iron than all the other European nations combined. The old economic structure collapsed. Thanks to this relationship, Spain enjoyed for a long time a superiority which rendered possible her formidable naval and military hegemony. Now, however, she found herself outclassed. The same was true of both the Mediterranean and central-European regions. During the first half of the nineteenth century, when stratigraphy became an independent science, the resultant technological advances paved the way for the sinking of deep mine-shafts in the coal-

rich regions of the Continent. An important industry was established in Germany, Belgium, and France, close to the great rivers; it succeeded in counterbalancing the lead taken by the English. Thus northern Europe, in possession of heavy industry and coal, the latter the only available source of energy, acquired extraordinary power. It became the undisputed master of the Continent.

Toward the end of the century the position of northern Europe grew weaker. Coal fields were discovered in the United States in the Great Lakes area and in the Appalachians, in the Donetz area in Russia, and in certain regions of Siberia, Manchuria, Japan, and China. These coal fields were considerable in size and close enough to iron mines to give rise to a flourishing heavy industry, which rapidly developed a tremendous rhythm, especially in America, where the coal deposits were far more abundant than elsewhere. The layers were so thick that large-scale efficiency machinery, unknown to western Europe, could function at full capacity and thus reduce the cost of production. It was in this way that the United States achieved first place among the steel-producing nations, with the Russians following closely. Europe lost its former position of superiority.

And this was not all. The Mediterranean, then the West, witnessed the disappearance of the supremacy enjoyed until then by the maritime nations, which had made them commercially pre-eminent for centuries. Throughout the past progress was achieved very slowly. It could not be otherwise because man lived as a prisoner of his geographical environment, from which escape was difficult. Mountain chains, deserts, rivers, the dreaded sea—all these constituted almost insurmountable obstacles. Isolated from one another, people vegetated, and any exchange of ideas could be achieved only very gradually. This explains the slow awakening of humanity and the millenniums that had to elapse before the advanced civilizations of antiquity could be absorbed.

The rate of progress quickened when the Phoenicians adapted for use at sea the craft devised by the Egyptians for navigation on the Nile. Living in an auspicious geographical environment—the Aegean Sea is full of little islands that make possible a one- or two-day run—and possessing a knowledge of astronomy acquired from Babylonian scientists, they learned to sail over the boundless deep. From then on maritime communications grew rapidly and soon surpassed those proceeding overland. Commercial activity and an interchange of ideas followed.

The Mediterranean thus became the locale of great civilizations.

Supported by fresh knowledge in astronomy and mathematics, which paralleled an improvement in the techniques of ship-building, the art of navigation developed into a science. This in turn made possible the discovery of America. Thereafter the axis of human activity shifted. The Mediterranean began to decline. The coastal areas of the western Atlantic inherited all the advantages of an extremely favorable position. At the end of the eighteenth century the science of navigation was transformed into a simple technique, that is to say, into a more accessible key to transportation; and this occurred at the very moment when the industrial revolution was beginning in these regions. Thus, heavy industry was established in countries that were either close to the preeminently commercial sea or in communication with it by virtue of the proximity of large rivers. The construction of a large network of canals made the position of these countries even more auspicious. In short, the geopolitical iron-coal relationship came to assume an extraordinary importance thanks to the development of maritime communications. This proved detrimental to those regions of the Continent that already suffered from a lack of overland communications.

Hence, ever since the dawn of antiquity, it is in areas close to the sea that civilizations have always flourished. One has merely to unfold a map of the world to realize this. Ancient history, human geography, political economy—they all point to the supremacy of maritime regions; and modern history apprises us of Russia's effort to secure an outlet to the sea. This situation is today, however, in the process of alteration.

As early as the middle of the nineteenth century a real revolution in land transportation commenced. We must not lose sight of the fact that ever since the days when great highways were built human relationships everywhere had scarcely changed, despite the progress achieved in other sectors, notably those having to do with the sea. Napoleon's soldiers moved at the same speed as Caesar's legions in spite of an improved technology and the knowledge acquired during the century of the Enlightenment. But in 1840 the situation began to alter. The era of railroads was inaugurated. Thereafter communications multiplied at an accelerated rate. Commerce, industry, human contact, the exchange of ideas—all these proceeded with an intensity before unknown.

However, these new advantages could not as yet transform the geopolitical coal-iron relationship in regions rich in coal and abounding in

maritime and river communications. Cargo ships and barges, because they were cheap, retained their primacy in the transportation of heavy goods. This primacy was aided by the fact that an extensive and rapid network of railways can operate only in level areas. Most of the coal regions were not disadvantaged thereby, for the layers that had formed during the coal age, millions of years ago, precisely because they were so very old, were to be found in the peneplains, that is to say, in eroded regions honeycombed with Hercynian folds that once constituted a chain of mountains which have since disappeared. All that remains is coal and a surface track. In other words, the first railways, far from being harmful to regions favored by the coal-iron relationship, enhanced still further the privileges that a tremendous prosperity had bestowed on them.

On the other hand, mountainous regions, particularly areas where an ancient orography did not permit the existence of deep valleys, were plainly in a position of inferiority. Thus the Pyrenees contrast with the Alps. The situation became far more serious as regards high plateaus which cover—this we must not overlook—a large part of the earth's surface. Here, the railroad that starts from the seacoast or any seaport must scale steep mountainsides. The cost is so high, at times even prohibitive, that a heavy traffic is out of the question. During the nineteenth century, railroads were constructed in France at a cost of one hundred thousand gold francs per kilometer. In Spain, which is a particularly hilly country, the cost was five times greater. For analogous reasons, the most important regions in Asia and America could not compete with Europe.

Thus Spanish America lost the supremacy it enjoyed during the eighteenth century. At that time some of its viceroyalties significantly surpassed the small European nations; their capitals counted as many as one to two hundred thousand inhabitants. New York had a population of only forty thousand—a mere village. But during the nineteenth century all of America was dependent on the coal fields discovered in the Appalachians and in the Great Lakes regions. This explains why, during the Civil War, the agricultural South could not defend itself against the industrialized North. The same disparity existed in Asia, but on a smaller scale, of course, because economic development was not as advanced. China and Central Asia were unable to compete with the Siberian steppes and with Manchuria. As railroads improved, how-

ever, an evolution ensued that completely transformed Continental communications.

Competition began when the first railroads were built. The maritime and river routes no longer enjoyed a monopoly. The first railroads, which traversed long stretches of land, were more expensive but faster than water transport. However, they could haul only light loads. The introduction of electricity increased both their capacity and their speed to an unprecedented degree. An electrified line was of course faster and also more convenient than river transportation, which was slow and required long and complicated operations. Recently, railroad transportation has expanded at an extraordinary rate, thanks to greatly improved freight cars and locomotives. A few years ago a steam engine could haul some six hundred tons. Today, a Diesel or electric locomotive can pull freight totaling as much as four to six thousand tons and can, in addition, be automatically loaded and unloaded. Thus the railroads can transport more tonnage than a barge and as much as a cargo ship. Moreover, they can do this with greater speed and in areas that are not favored by peneplains, seas, or the coal-iron relationship. This relationship became so widespread that it proved easy to set up a "combine" between very remote mines and those that were centrally located, and, in turn, made it possible to build an important, complex industry on a certain site chosen for reasons of expediency rather than imposed by geographical determinism. Thus systematized, the geopolitical relationship could be attained to further a strategic concept, control a market, or simply to promote industrialization. The Russians organized an important metallurgical industry in Siberia, and its success was far more revolutionary than the events of October. The old industrial hegemony of the privileged maritime regions was overturned.

On the other hand, currently there are symptoms that point to the possibility of an alteration in the coal-iron relationship which are comparable to developments of the eighteenth century. We are referring to the discovery of new sources of energy—the multiple uses of electricity, the exploitation of deposits of natural gas, the manufacture of industrial gas and the long-distance conveyance of this gas by pipe lines, and, finally, nuclear energy.

Appearances notwithstanding, from the standpoint of the coal-iron relationship the gas industry is far more revolutionary and more constructive than atomic energy. Unless we are greatly mistaken, atomic

energy, at least until now, has been successfully used as a substitute for coal solely in producing the steam that drives turbine motors, and steam is a source of energy that is today outmoded. To really alter the coal-iron relationship, it would be necessary to produce steel by means of an agglomeration of molecules, without using coke or a blast furnace; this might be accomplished with the aid of a process currently under scrutiny or by imitating a method that is now being applied in certain specialized industries. Regardless of whether this would be feasible in the near future, the existing metallurgical industry is doubtless falling into disuse owing to the coal-iron relationship. Very soon coal of every kind will be distilled, not burned; and since gas can be conveyed over long distances (in the United States this is already being done), heavy industry will be dispersed over the entire surface of the earth instead of being concentrated in the most propitious areas. Soft iron ore, which can be treated by oxygenation or by some other method, is abundant. According to the same economic principle, it could be used to convert peat and lignite into gas. Our present-day blast furnaces, with their cumbersome appliances, would no longer be necessary. The enormous concentrations of population would split up. Work would become enjoyable. Large-scale automation would disappear. So would smoke stacks, with their thick clouds of soot. Large-scale heavy industry would cease to belong to the privileged few; it would be available to everyone.

Light industry, which was likewise dependent on the coal-iron relationship, had been developed in the same propitious regions because it needed coal as a source of energy. Moreover, railway transportation imposed a limit on its geographical dissemination, and the proximity of large sea ports conditioned the export of the finished products. But when large dams were built to produce electricity, the situation began to change. Whereas during the nineteenth century light industry had been concentrated in the coal regions, later a large-scale decentralization took place; this process was accelerated by the two world wars because many extra-European nations were obliged to build, sometimes because of state intervention, the factories they badly needed. As a result, light and semi-heavy industry was widely dispersed. Some people may cling to the delusion that industrial regions still control the market thanks to retention of the raw materials—coal and steel. As we know, nowadays this is definitely no longer the case; industry in general is freeing itself

more and more from geological and geographical determinism, to the detriment of the old monopoly.

We must therefore conclude that the geopolitical relationship, which in the past gave rise to the metallurgical industry and during the nineteenth century conferred a tremendous preponderance upon certain European nations, today seems to have reached the end of its evolution. Initiated during the third millennium in Asia Minor and in Andalusia, it developed in the course of time in keeping with the nature of the combustible. When charcoal was used to feed the furnaces, the relationship was determined by geography: large forests and climatic changes. When coke replaced it, the relationship depended upon geology. Thanks to new methods that are emerging today and are being used more and more, geophysical determinism, which tyrannized over impoverished societies, is on the verge of being shattered. A new era is emerging. The *gea* will no longer impose its laws; the idea alone will be decisive.

A similar conclusion could be reached by analyzing other geopolitical relationships which have had a decisive importance in the past and which today have assumed considerable scope. The problem of irrigation, for instance, seems as striking to us as that of heavy industry; for we must not forget that irrigation once made possible a concentration of population, wealth, and power that transformed certain countries into first-class nations.

In the course of his millennial struggle to master nature, man succeeded in perfecting certain processes that enabled him to increase the yield of his land, of which irrigation has always been the most important. This very ancient geopolitical relationship has rendered service ever since the third millennium. But nowadays a profound change has come over the application of techniques for diverting a stream or constructing water mains. The use of cement for the construction of giant edifices, the appearance of new machines, and the benefits of additional experience have made possible outstanding feats in the building of dams and canals. The latter are as important as rivers because they can span the most difficult natural obstacles with the aid of enormous bridges, tunnels, and channels. Similarly, ways have been found to transport water over considerable distances. Like the modern "combines" based upon the coal-iron relationship, the geopolitics of irrigation has been immeasurably expanded throughout the world. Today,

land is irrigated hundreds of kilometers away from the source of supply, a feat that would have seemed fantastic only a few years ago.

And so we find ourselves facing a new situation. One thing is certain; in some geopolitical relationships the scales definitely incline toward the idea, to the detriment of geophysical factors. This is the consequence of man's extraordinary effort during the last few centuries. However, are we warranted in generalizing about the problems that have to do with changes in the geographic environment, viewed as a whole? In other words, can this geographic determinism, which has weighed so heavily upon the fate of humanity, be attenuated, if not altered, today or in the near future?

It would be an exaggeration to say that, beginning with the time when he first discovered how to cut stone, man has evolved to the point where he completely masters nature. We can only assert that progress has become so rapid that we have now reached a decisive period. We are beginning to perceive the final phase of mankind's tenacious struggle. Certainly in many respects, as exemplified by the geopolitical relationships we have just described, the environment has been mastered; but in other regards the struggle is far from over. This is true, for instance, about the application of human ingenuity to the development of arid lands that constitute so large a part of most continents.

A majority of the world's population is today undernourished. It not only has a diet that is too low in calories, but in addition it cannot procure the protective foods, those that are rich in vitamins and give the organism enough strength to overcome disease. And on the basis of inferences that may be drawn from our present scientific knowledge, it does not seem possible that this situation will undergo any radical change in the near future. This is due to the ever increasing expansion of arid and sub-arid lands, to a decrease in the fertility of productive areas, and, inversely, to a disproportionate rate of increase in the population.

Irrigation could prove to be an effective means of augmenting our food supplies in the future, just as it proved to be the basis of antiquity's great civilizations. We have here, however, a structure that is not susceptible of infinite alteration. The hydraulic reserves and the great rivers, whose strategic location makes possible the establishment of the relationship, are limited. The irrigation of new lands will have a bene-

ficent effect on the requirements of certain regions, but it will prove incapable of solving mankind's general problem.

At the present moment such a solution does not seem to hinge on an extraordinary extension of classical geopolitical relationships. During the burgeoning of our emergent civilization, the *gea* becomes immobile, but the same cannot be said of the idea, which has attained in our time an unprecedented effervescence. This development might conceivably serve as a basis for the formation of new geopolitical relationships. The consequence could be a new and industrially rewarding method of treating water destined for the irrigation of certain countries. In addition, discoveries in the field of plant biology might revolutionize the utilization of arid lands.

The world is seething with possibilities; but in our opinion one reality exists today which cannot be overlooked: the extraordinary development of communications. The means of transportation are basic to every transformation of a backward area, and hence of its agriculture. Without such transformations it would be futile to expect a reasonable output from modern technological devices. Moreover, the extraordinary ease of present-day travel has made possible the rise of a new outlook which will condition life in the future.

Everyone knows the important role played by commercial interchanges and by intellectual and personal contacts in the historical evolution of ideas. The deterioration and resurgence of civilizations, the increasingly intensified succession of higher ones, and the critical spirit which destroys legends and prejudices have always been determined by the state of communications. By observing others, one comes to know one's self. Shortcomings get to be so conspicuous that it is easy to uncover them. The idiocy of certain outmoded actions or ideas emerges when they are contrasted with the customs of others. Contact with a distant and superior idea gives rise to a response: a synthesis results from this dialogue and new horizons appear. But in the past this sequence has always proceeded with discouraging slowness. Yet its tempo has been quickened by the development of the means of communication during the last two millennia. This acceleration is due mainly to travelers. According to Montaigne, to travel is "to rub and sharpen one's brains against the brains of others."

Thus historians have amply demonstrated how much the evolution of ideas during the Middle Ages owes to the contact between the Cru-

saders and the Orient and to the encounter of Andalusian civilization by pilgrims bound for Saint-Jacques de Compostelle. On the other hand —this has certainly been true until our own time—the masses almost never moved about. The sedentary farmer hardly ever strayed off his lands. But we are witnessing something new. Ordinary folk are beginning to travel in considerable numbers. They are not seeking far away places to settle down in, as emigrants have done, in order to make their fortunes in a more favored spot. Rather, they travel to become more familiar with places near their own homes and even venture to foreign countries; but they return and enjoy discussing their impressions.

This is but the beginning; it is altogether possible that in the future tourist travel among European nations will expand and become organized on an inter-Continental level. With communications more accessible, men will tend to become more unified, to attain a greater harmony among themselves. We can assert once again without any equivocation that in this sense a new epoch is opening up before our eyes: a truly international way of thinking that will impose itself more and more on routine intellectuals, on modes of thought, and on provincial prejudices.

The internal combustion machine caused the real revolution in transportation. Railroads had already given impetus to such a trend. But, except for certain specific regions where the railway network was the most dense, cars were merely substituted for stage-coach carriages, and they served a very small number of people who traveled long distances. The compartment had inherited the closed interior shapes of earlier times; save for those who lived near large capital cities, farming or working-class people rarely used this mode of transportation. To take a train was an important event. At a time when large, fast trains spanned all Europe and required several days to do so, only the rich traveled—and only those rich who had a penchant for the exotic. In short, tourists were a small minority.

The automobile brought a genuine revolution in the pace of human progress. It made possible individual autonomy on a scale hitherto unknown, as well as personal interchanges and contacts that had never before existed—or at least not to such an extent. Nowadays, in Europe and in America, the middle and working classes travel a good deal and sometimes they go long distances. This is an extraordinarily widespread phenomenon that will rapidly alter popular modes of thought. It is

well-nigh impossible to assess the repercussions it might have in the near future; but we can definitely predict that henceforward the intermingling of peoples, if it continues at the current rate, will result in a blending of minds from which will spring the *idée-forces* of the future.

This trend has been further accentuated by the tremendous acceleration which aerial communications have undergone in recent years. Aviation today plays a role comparable to that of the great luxury trains of the last century. It has resulted in swift and convenient contact between the most distant places. To be sure, the masses cannot as yet benefit by it, but it has enabled the elite of widely separate continents to exchange ideas more frequently than ever before. Moreover, the influence of aviation has assumd a surprising form that deserves a certain amount of attention.

The expense of building railroads in areas possessing a difficult orography—and this is true of most continents—had not served to encourage as much contact as that which existed between the peoples of the European continental plain. Thus, in spite of the railroads, mountainous Spain possessed poor communications until quite recently. Although she had improved them markedly since the era of stagecoaches, she was, compared to other Continental nations, definitely lagging. The same was also true in America and in Asia, but on a much smaller scale. It was both easier and cheaper for a resident of New York or Buenos Aires to know and enjoy Paris than to visit the large cities situated in the interior of his own country. Until the advent of the internal combustion engine, a trip across the Continent from New York to San Francisco represented quite an expedition, and certainly one that was more expensive than a holiday in Europe.

Today the situation has been reversed. The development of aviation has had consequences that occasionally surpass the impact of both the railroad and the automobile. Vast regions of Asia and America do not as yet possess either highways or railroads because natural obstacles make these too costly to build. It is the airplane which has opened up these isolated regions. Surprisingly enough, this is true of Spanish America. The tiny republics of the Isthmus of Panama have subsisted until now by maintaining their traditions and turning their backs to each other. Similar handicaps weighed heavily upon the internal communications of other countries situated further south; above all, the tropical forest constituted a formidable obstacle. It was hardly a pleasure

to traverse the four hundred kilometers or so that separate Quito, the capital of Ecuador, from Guayaquil, the equatorial port on the Pacific. The immense provinces of Brazil and Argentina were, so to speak, at the other end of the world. It took many days and great effort to get there. If, defying all geographical principles, the political unity of these countries has survived, this is due to the persistence of a deeply embedded culture for which three centuries of civilizing Spanish influence can take credit.

Aerial communications have radically transformed this state of affairs. In 1925 it took over a month to go from Buenos Aires to San Carlos de Bariloche, the capital of "Andean Switzerland." When, in 1930, the construction of the railroad was completed, it still took two days. An airplane made the trip in a few hours. This is but the beginning. Reciprocal contacts and the closest relationships are constantly being established. A new geographical structure, a different psychological climate, will materialize very shortly. The same kind of thing is true of other continents.

However, mind anticipates matter. The intellectual, surrounded by his beloved books, already possessed a general understanding of other nations. He had read the accounts of those fortunate enough to have traveled. He knew the globe's geography, and, if need be, he could consult charts and world maps. Occasionally he had even been able to perceive the essence of those civilizations that were located the farthest from him. Ever since the art of sailing developed in the sixteenth century the white man had traveled all over the world and established contact with the most remote regions. The intellectual minority could not go to see for themselves; but they entertained more or less exact notions about other peoples. This interest had further increased because businessmen launched vast enterprises, thus mobilizing technicians who learned to know and love these people. Technicians became more numerous after the advent of the steamboat; a more precise knowledge led to the disappearance of initial prejudices. Furthermore, to satisfy the exotic tendencies of a growing number of readers, the book industry reserved a large proportion of its lists for travelogues. The expansion of education served to encourage the dissemination of general ideas. Not only the elite but people generally began to become acquainted with one another.

Within the last thirty years this trend has attained frenzied proportions. First, the newspapers began regularly to send their correspondents to report from the most remote corners of the earth. Animated illustrations followed this reading material. For the benefit of the masses the movies portrayed landscapes, scenes from daily life, festivals—all the folklore of peoples living in the antipodes. Soon radio, in its turn, intervened. One heard the strangest voices over the loud-speaker. The Westerner, who has not traveled beyond the seas, nevertheless knows nowadays how Rusisan, Arabic, and Chinese sound to the ear. Finally, television has brought into the home a picture of those events that warrant special attention. Within a few years all the important broadcasting stations located on the various continents will be working together so that each of us, comfortably seated in our own homes, will be able to view daily events on a world-wide scale.

We can therefore say that today we are witnessing the development of two phenomena that are extremely important for the future: a shrinking of the globe and a more powerful intellectual cohesiveness among its inhabitants.

We can readily deduce one immediate consequence: the civilization toward which we are inclining, this civilization which each of us in his own work is trying to construct, will depend on two factors of major importance: ideas conceived on a global scale and a new geographical framework. We are therefore justified in believing that sparks unknown in our times will burst forth between these two poles. Geopolitical relationships whose structures we are now incapable of predicting will constitute the foundation of a future society.

Marius Schneider

ORIGIN OF THE SYMBOL IN THE SPIRIT OF MUSIC

I. FUNDAMENTALS TOWARD A DEFINITION

The symbol is a form composed by man more unconsciously than consciously. With primitive peoples, this form seems to have been born from the desire to penetrate to the kernel of supernatural or magical power by means of a concise formula, all-inclusive or ambiguous, particularly through a magic incantation or a song. This penetration, however, is only possible if one understands the inner structure of such a power. According to primitive belief, the true seat of this power is not found in the world of our direct experience but in a magical area in which it rests in a completely abstract, latent state. In this condition it has not yet spread out into various shapes which it has to assume for concrete manifestation but appears completely homogeneous and solid. Moreover, the innermost substance (kernel) of this power is always organized antinomically. From this fundamental tendency to include opposites in a dualistic way, thunderstorms for example emerge as a

Translated by Edith Cooper.

dual combination of fire and water. Also dualistic is the "fiery stream of volcano and smithy," the light-dark, hermaphroditism, etc. Psychologically, the original dual event is expressed in the fusion of love and hatred or the combination of a lust for power with inferiority.[1]

If we train our eye not on the homogeneous substance withdrawn from the direct view but only on its outward appearance, we will experience only a few very specifically limited partial manifestations; that is, the concrete, individualized single aspects of the split-up power and never its fulness or its primary form (the homogeneous kernel). Thus we recognize, for example, in the outward appearance of warmth (the blooming of a plant, the melting of metal) only the momentary effect of warmth in a limited area but not the innermost nature of this power, which, unchangeable as it is in its substance, manifests itself differently in its outward appearance from one case to another.

With a purely superficial method of observation we can also never hope to grasp the second characteristic, the antinomic character, of such a force, because we cannot grasp the simultaneous flow and counterflow, the simultaneity of thesis and antithesis in this magic power as a homogeneous *coincidentia oppositorum,* a true amalgamation of opposites, but can only imagine a periodical change. We shall always see only one side or another of a phenomenon.

The task of the symbol to grasp a given force in its essence—stripped of all outward manifestations—to make apparent its homogeneous background and at the same time to embody its antinomy can thus not be carried out by pure intellect. Therefore the symbol can be created neither by logically reasoning intellect nor by clear observation. It must originally have been the work of that region of the human psyche in which the confusing multiplicity and antinomy of phenomena could, without resistance, be accepted and assimilated as a unit. In other words, it can only have resulted from an irrational wish in the subconscious overriding all processes of logical thought.[2] But since neither *coincidentia oppositorum* (dualism) nor a cross-section of the various single manifestations, penetrating to the homogeneous kernel behind them, is rationally possible or acceptable, this view can be affirmed and

1. These are trains of thought which the author abstracted from a series of conversations with three Baule Negroes who had for a long time served as cult drummers.

2. C. B. Jung, *Collected Works,* Vol. IX: *About the Archetypes of the Collective Unconscious* (New York: Pantheon, 1953).

made legitimate only in the area of the cult. Cult makes real and present that which is supra-rational and in the background. Only ritual—this intermediate world supported by myth which by definition is meant to overcome the multiplicity of appearances and to adjust the great contrasts (heaven and earth, time and space) through a fusing dualism—only ritual can speak the mediating language of the symbol, the language which tries to give man access not otherwise attainable to the roots of a force.

The symbol, then, which is to condense the diversity and inherent contradiction of things must be a tool whose effectiveness places it above the accidental or single event. It should be able to hit upon the basic homogeneous kernel of a force (this is, to furnish a cross-section through the various manifestations of the same force) and, moreover, to embody organically the inner antinomy of this force in such a way that it is not itself destroyed by the task or the desired force weakened or changed in its structure. Such a tool, however, gifted with the language of the cross-section as well as with the antinomy of a given power, can of course never itself become this power; but it can be its stream-bed. This determines the character of the most ancient kind of symbol. It is a tool which is meant to catch and channel the flow of an antinomic power, which is not to be grasped rationally in all its depth, in such a way that man can partake of it.

2. THE SILENT SYMBOL

Since the modern study of symbolism (except for psychological research) is primarily concerned with the recording and interpreting of concrete forms and since the description of the psychological phenomena leading to the formation of the symbol is rarely accompanied by a simultaneous thorough analysis of material symbolic forms, it seems proper to begin this discussion also with the traditional treatise on concrete forms.

Let us take first the combination of opposites, rain and sunshine, often made the symbol of blessing and fruitfulness. That this picture of rain during sunshine as a *coincidentia oppositorum* to fruitful labor is not a symbol in the original sense can be seen by the fact that it can encompass only one appearance of fertility, that of vegetative life on earth. The image is too superficial. It clings too much to a single manifestation, and any other manifestations of the power of fertility have to

be supplied by the intellect. The prerequisite, however, for the oldest kind of symbol, independent of intellect, is not only the welding-together of outward contradictions but also the independence of the outward forms from any accidental manifestation. The symbol is set, and the less realistic it is, the more it is suited to its purpose. The symbol must show not only a single aspect of a given power at work but must also penetrate to its primary seat (lying much deeper than the outward appearance), from which the working power has already emerged by the time it has become a concrete phenomenon. In other words, the symbol must reach the homogeneous metaphysical kernel; that is, the whole of the still undivided power. With many primitive peoples such a symbol is, for example, the singing mask. This "home for spirits" encompasses the dual aspects through its construction and use. It achieves cross-section by means of its fantastic shape, which, because it has no counterpart in nature, can be looked upon as the magic seat of the as yet undivided power. A similar attempt to imitate symbolically the dual stream-bed of a whole power was made by the ancient high cultures by means of the abstract art of geometric or mythological figures—for instance, two spirals growing toward each other, hermaphroditic creatures, or fabulous animals. The power of sacrifice, at once physical and spiritual in its effect, was symbolized by a winged steer or a phallic tree. Courage, blazing fire, the sun (cross-section), could be symbolized by the winged lion ready to attack; and their antithesis (force at rest, glowing embers, evening sun) by a weary lion. Of course this was possible only on condition that such animals were made to look not individual or realistic but as abstract as possible.

But even these figures cannot solve the problem completely; for although the mythical imagination here attempts to overcome separate concrete categories of phenomena in nature and to indicate the *coincidentia oppositorum* by, for instance, giving wings to a steer, it is still forced to express itself by means of two concrete and specific elements: body of a mammal and wings. Beyond the concrete single phenomenon we really have only the combination of two elements.

As far as geometric symbols are concerned, they do have the advantage of greater abstraction, but they lack movement which, even in the winged steer, can be only implied. Without movement, however, the original symbol is to be neither imagined nor carried out. The original symbol must be animated, since primitive man feels all power as a

palpable, usually even revolving or spiral, movement encompassing the whole dynamic cycle of this power, with all its peaks and valleys, its thesis and antithesis. The form given a power through a profound human need can indeed become a symbol for primitive man if it not only means something but at the same time can be the bearer and guide of living, moving reality, to be experienced psychologically and physically, and in which man can take part with body and soul. The original symbol cannot be an abstraction, a thing which only represents a force; it has to be a channel for a palpably working force.

But just this last and most important condition cannot be fulfilled by the unanimated picture, since it is not able to make the flow of a power into a reality and, moreover, can always represent only a single moment in the unfolding of a given power. And only in the rarest cases can it express both the unfolding and the recoil (thesis and antithesis) at once. There is a second great drawback to the unanimated picture: it suppresses another factor essential to growth in time, namely, the kind of dynamics with which a power unfolds. The image of the winged steer is the lifeless picture of the moment taking the place not only of a living, moving steer (or a corresponding masked dancer) but also of a roaring steer. Where these fabulous animals are not represented with open mouth, their wings indicate a voice of thunder, since in ancient symbolism feathers are primarily used to express sound translated into the visual (feather-dress). Later on, winged creatures were gradually replaced by musicians. The limitations of this paper prohibit further penetration into the musically symbolic meaning of feathers.

Near and East Asian fabulous beasts carved of stone which have been preserved until now are probably only figures taking the place of a real, that is, a living, symbol. The real symbol was a ritual dance whose magical background power was primarily expressed by the shouts of the dancers. The winged cherubim and angels of the Old Testament, too, were only the visible expression of the singing power of the heavenly choirs.

These roaring or singing fabulous creatures represented in the ritual of high cultures have their counterparts among primitive cultures in the ritual animal and mask dances, in that they represent a power personified by a visual image, whose cry is its most forceful expression. When such dances are "led" by the drum, the movements of the dancers are meant to be only the visual expression of the drum rhythm, which

is itself full of symbolic effects. In places where this process can be observed today and where the few historical sources have something to say about this rather obvious fact, we also find that a dancing creature of this kind can become a symbol only when its "voice" enables it to become a bearer of and speaker for a higher power.

It is very strange that this crucial meaning of the acoustical phenomenon seems constantly to be ignored in the study of symbols, even though ancient literature and ethnographic reports overflow with examples characterizing the voice as the highest expression of creative power and as the most elegant and penetrating form of unfolding strength.

3. THE SOUNDING SYMBOL

This sounding power was, in fact, considered the basic substance of all the forces in the universe by the cosmologies of the high cultures of the megalithic period,[3] particularly by the commentaries upon them, as, for instance, the *Upanishad*.[4] It was to have been the dream-substance from which originally the whole world arose. As analogy to the life of man or the course of the day, this sounding dream-world is also often referred to as childhood, or the dawn of the universe, or, briefly, as the time of the dream, to which then logically corresponds a second dream-period, that of old age or dusk. But we also find such concepts with primitive peoples. A myth of the South American Uitoto[5] describes the dream-period of creation as follows: "In the beginning, the word gave birth to the Father (creator)." Then it says: "There is an unexplainable substance which seems an illusion and yet exists in a form hidden from the senses, to be experienced only in one's thoughts. From this the world came to be, when God touched the unreal substance and, following a dream, held it fast through the breath of his mouth by the dream-thread. But when he examined the treacherous ground, it was not there. He pressed on the emptiness with his magic staff and, dreaming, held on to the substance; stamped on the imaginary floor to make it firm, and lay down on that which he had dreamed (the earth)." Then

3. About its distribution see Hermann Baumann, *Das doppelte Geschlecht* (Berlin: D. Reimer, 1955).

4. Marius Schneider, "Le Rôle de la musique dans les civilisations non-européennes," *Encyclopédie de la musique* (Paris: Gallimard, 1959).

5. Theodor Preuss, *Religion und Mythologie der Uitoto* (Leipzig: Hinrichs, 1921–23), p. 25.

emerged from the mouth of the creator the sounding *refuenas* ("one who makes a tale" or "is a tale"), the words of which contained the names and the life of all things. To make the rain, he seized, or himself became, a tree-drum from the sound of which the waters gushed out.

The concept that this original music of creation breaks out anew in each newborn child and sounds somewhat different with each individual is also found frequently in primitive as well as in high cultures. But it culminates in the conviction that this dream-music, in its at times varying shades, not only forms the kernel of each individual, but also joins this kernel with the primeval past, the singing dream-period in which its bearer is rooted.[6]

Indeed, all cosmogonies regarding the non-material, the sounding-power, or the "word" as the origin of creation consider the acoustic phenomenon as the antinomic basic substance of all things in the process of growth. This sound is antinomic in that the acoustic event begetting all life issues from the mouth of death (the creator).[7] In this dream-substance, at first completely without image and without concept, the antinomic event is still a natural process, not a self-contradiction, because at the beginning of creation there was neither formal, logical thought nor a material, palpable manner of manifestation into which a given force would have to split itself during a concrete unfolding. But even in the finished world in which the sounding primal force has to split itself into various concrete shapes, the acoustic primal substance remains in the background of all manifestations, although at this late stage of creation it is often covered with its material clothing, or

6. The philosophy of the Yoga Vasishta takes the position that, in fact, all objects are a creation of our mind, not only the things we experience in dreams. Maya is not only the created world but also the principle of creation. Things have no individual existence apart from consciousness. But music, because of its finely grained nature, is so little burdened with the concrete imaginings of illusions of the world of our imagination that it forms the real border line between truth and illusion or the conscious and the unconscious. The Tibetan Yoga of the six doctrines says that between earthly illusion of the senses and the Dharma Kaya, the holy incorporeal truth, stands the Sambhoga Kaya, which is not recognized by the soul until after death, in Bardo. This Sambhoga Kaya, which is "the invisible, super-physical body-aggregate of the perfect spiritual attributes of a Buddha," is experienced by the soul as a series of sounds. It is a kind of perfect melody formed from the sixty perfect vowels of Brahma. "As form, the Sambhoga Kaya is mentally inconceivable, as sound it is not wholly beyond mental comprehension" but stands on the border between illusion and knowledge. (W. Y. Evans-Wentz, *Tibetan Yoga and Secret Doctrines* [2d ed.; London: Oxford University Press, 1958], p. 213 and n. 2).

7. Schneider, "Die historischen Grundlagen der musikalischen Symbolik," *Musikforschung*, IV (1951), 116.

made mute, to such an extent that its innermost nature and its origin in the sound-world of the primeval can at times hardly be recognized. But, concealed as this substance may be, it always remains the decisive border area which enables each object to keep in touch with its dream-origin.

This great value put on the sounding force can also be recognized clearly in the rituals in which song forms at once the substance of action and the bridge (border substance) to that dreamland in which the primal ancestors watch over the sources of life. In totemistic cultures and in ancient China the sound of the first cry of a newborn child is carefully tested at birth to determine with which mythical ancestor the child is most closely akin. In totemistic cultures this relationship with the future guardian was, to be sure, not determined until puberty—after the changing of the voice. To this end the young man has to hear, during the time of his preparation for initiation, a voice in a dream which corresponds to his new vocal register. When he has thus become conscious of the connection between his own nature and that of his ancestor or totem, he also adjusts the formal composition of his individual cry or song to the song form heard in his dream in such a way that now the sound of his voice, as well as his melody, becomes that common acoustic border substance in which he can meet and identify with his dead ancestor. If he shows a special gift for imitating the hissing of a certain snake or the blustering of the wind, then he must be classified genealogically with the totem of that snake or wind in which his patron is manifesting himself at the time. The fact that he is able to imitate one or another of these voices exactly is proof enough to identify him in his innermost being with the totem.

Sound, then, is not only the most concentrated compression (symbol) of his being and the strongest expression of the kernel of his personality but also the bridge (cross-section) between him, the totem, and the ancestor, or between the present and the primeval past. The totem-bearer throws a bridge to his acoustic counterpart in the nether world by answering him, whose song he heard in a dream, in a similar way. But his song is only effective and compelling if the disembodied ancestor has truly manifested himself as song to the singer and if the voice of the living singer has become, through exact imitation, truly the vessel of the voice of the dead one.

This brings us to the original form of the symbol. It is the living man whose voice unites with the voice of a being analogous but opposite (dead) to him (dualism). On the basis of a common tone substance, a living and a dead individual (rising above all differences in appearance) enter into a common action; and out of this dualistic union arises the apparent self-contradiction, i.e., the living corpse or the singing dead. It is only through this acoustic joining, allowing the dead ancestor to speak through the voice of the living or to "ride" on this voice, that living man can fully become a symbol. It is only through these *coincidentia oppositorum* that he himself can become the best possible stream-bed for the flow of that higher power in which he desires a share. And if, besides, he assumes certain bodily attitudes and performs pantomimic dances representing the stream of this power, then his outward form is only a visualization of the sounding dynamic power which flows through him at that moment.

The activity, then, which enables this man to become a partner in the sounding force consists primarily in the imitation of his own dream-music. Logical antitheses felt by waking man between life and death, or himself and his inmost soul, are bridged over and united into a whole in pantomimic dance and at the sound of the dream-music. The preference given to the voice in this imitation is doubtless due to the fact that it is the most adaptable organ of man; for with no disguise and no imitation of visible physical rhythmic motion can man imitate a phenomenon outside himself (the snake, the wind, the sea) as realistically as with his voice. Indeed, the ability of primitive man to imitate sounds of nature surpasses all the expectations of the average European. Moreover, the physical sensations and the sense of reality with which primitive man combines the vibration of his voice are so strong that speech, singing, and shouting are probably to be regarded as vital factors in the genesis of a consciousness of existence and the trance state.

We can already observe in children how deeply rooted is this urge toward acoustic imitation. No boy who has seen a lion in the zoo will omit imitating its roar when playing lion at home. Imitation of the voice will always be more important than all external physical imitation, and it is only after the sounding-power has been prepared openly or inwardly that the lion's rhythm spreads to the hands—hands which would like to become paws but will always remain the hands of children.

Indeed, there seems to have been a *clamo ergo sum* long before the *cogito ergo sum*. The very first cry with which the newborn child establishes contact with the outside world supports this view. Also, the constant babbling of the same short "melody," which seems to produce the same sense of well-being in the infant as it does in primitive man, probably does so because in this singsong the meeting of mental desire with physical action is immediately realized, and, moreover, realized as bone-vibration as well as movement. The mental wish thus is not only physically gratified but, by the physical counterplay itself, again directly influenced, made rhythmic and regular. The singsong actually affects a rhythmicization of the antinomy and a psychophysiological relaxation by which rigid antitheses dissolve in fluid movement and can even be transformed into play. In the adult, too, a feeling of balance and relaxation is created by the rhythmicization of the sounding breath, but only when his singing-power rises from the true center, that is, the acoustic power center of the network of the sun, called by the Taoists the "area of the elixir of life."

In the face of these facts it seems safe to assume that the sounding symbol had from the beginning also a therapeutic meaning. The silent symbol of later cultures probably had this meaning to a much lesser degree, because there, apparently, the purely intellectual meaning of the symbol stood much farther in the foreground than the purely psychophysiological channeling power. In fact, we can probably count as true stream-beds only those later symbols, the contours of which man is able to imitate with his body (certain animals, pillars, trees, the cross, the trapezoid, etc.), since man can, in part at least, still enter into a physical feeling for these forms on the basis of his own physique.

But even these living symbols remain empty channels as long as they are not flooded with the vibrating breath of language or song, i.e., the singing-power, by which man (between body and intellect) is immersed in the stream of the subconscious. It is therefore also highly probable that the fabulous animals which we have rediscovered through the investigation of ancient civilizations were really only sacral images of practiced ritual acts. In this case they were not themselves the stream-guide but only shadows of those ritual attitudes and disguises with which the priests as living symbols actually carried out their cult. We know from the old as well as the new literature that the priests also imitated the appropriate animal voices.

The only form in which the later symbols (already more or less separated from the idea of sound) could become true channels of a given force might have been the mystical contemplation of them. By this attitude, man seems, after lengthy preparatory chanting, to have been able to travel through the whole border area of acoustical substance, reliving it psychophysically, in order to penetrate to pure nothingness or complete emptiness—to reach the soundless non-being of highest reality. But for the very reason that this way became harder and harder to travel and became passable only for a few predestined men at the same rate as the decisive aid of the acoustic phenomenon was being more and more ignored, the idea of the symbol as acoustic stream-bed probably retreated gradually before that purely intellectual attitude which asked only for meaning and not at all for the real manner in which the symbol operated as a tool.

4. PHILOSOPHY OF SOUND AND CONCEPT OF THE UNIVERSE

There can be no doubt about the central meaning of the sounding-power as antinomic cosmic foundation and lower stratum of the human dream-world as it is described in the cosmographies, the rituals, and the dream-philosophies of Megalithic cultures.[8] It is an important feature of the myths of creation in these cultures that the world always emerges from the non-material. In the beginning there was the soundless wish of the highest spirit to create the world. To this end he causes first the empty world space to emerge from his breath, by dreaming up the prime formulas of the world in the shape of supercomprehensible and inaudible syllables. This takes place in the deepest dark of the far north. Then the highest spirit breathes out an inaudible hymn of thanks, and from this hymn the body of the actual creator of the world is born who is to transmit the prime sounds to a new dream-existence, independent from the spirit of the highest being.

Now, when at the dawn of the east the creator, quietly and without passion, sounded the inaudible wish of the highest spirit, he grew like a singing tree or cloud of moist sounds into the empty space and filled it with his sound. This ends the first purely acoustic phase of creation. Then, when the creator (who was probably the singing prime-sun) traveled farther eastward, his songs, at first only ethereal and faintly

8. Schneider, "Le rôle de la musique dans les civilisations non-européennes."

sounding, began to glow. This brings us to the second period of creation, in which the dreamed prime sounds became visible songs. These ethereal sounding pictures were the "names" of the gods and of all future creatures.

The first created things, then, were names—meaningful sounds which had detached themselves from the foggy mass of prime sound under the influence of the sun's bright rhythm. They were sounds which stood between the original nothingness or void and the later concrete objects of which they were the names. They were the word or song with which the creator had formulated aloud the wish of the great spirit. Sound was thus the first substance with which the empty world space was filled, like a vast resonator.

But now the visible creatures wanted to have a concrete body and bodily weight. This they reached in the third phase of creation by hurling themselves with their singing and glowing rhythm into the still formless mass, thus stamping sense and form on it. Thus the planets came to be, moon and earth, and finally plants and the living inhabitants of the world. This ends the dream-period or childhood of the universe. The order of the acts of creation as I have just described it is particularly significant for our investigation: (1) the sound, (2) the light, and (3) the transition of the light-world into a concrete and visible existence. At the beginning is the dark sound, then this sound lights up and becomes visible, and finally the sounding images change to the concrete objects corresponding to their names by throwing themselves into the material mass.

I know of no unequivocal account anywhere of how the materialization of the sounding images took place and who the actual creator of the material world was, unless they were held to be pre-existent. If we seize on the two most frequent solutions to this problem, we find either that the creator himself descended to a partially materialistic form or that he remained pure sound and his mirror-image, i.e., the lord of material substance, is brought in as partner, because of his creatures' universal clamoring for more corporeality. In any case, in the creation of the concrete world we always find either a single being (but with dualistic tendencies) or a pair of brothers, the dark earthly brother always trying to eavesdrop on his heavenly, light brother for the secret of his singing power, in order likewise to be able to give form to matter. But his efforts are in vain, for the creator's secret lies in being able to

repeat, high and clear, without passion or arrogance, the syllables of the highest spirit. The dark brother, however, who is only a greedy imitator, can only croak or screech with arrogance. Thus he remains uncreative or brings forth only monsters and disasters.

From this dual aspect of creation, then, the whole nature of the world and of man is explained, man being constructed analogous to the world. The basic structure (ethereal-sounding, spiritual, active, and heavenly) at first was dark, then began to light up, and finally became visible. On the other hand, the material world which joined it only later was passive, lazy, discordant, or mute. But when, in the course of the third period of creation, the first "touching" of these two contrary parts took place, an intermediate world was born—the first material substance in which, however, the spontaneously vibrating spirit was still able to bring the mute mass into swinging motion, so that it was made to sound like a musical instrument. This half-concrete intermediate world thus was created when the spirit, originally only ethereally sounding, lowered himself into the mass and shaped it according to his will. But, since this first matter was still in all its parts finely grained and able to vibrate, it became a musical instrument under the influence of the spirit which penetrated it. This does not, of course, mean a specific instrument—only a world the matter of which was still vibrating strongly and the substance and effectivity of which were purely acoustic or musical. Myths state, for example, that the heroes of this intermediate world traveled inside drums or drank from cymbals. The world in question, then, is one in which force, until now only ethereally ringing, suddenly becomes audible in matter, audible by having created for itself a shell or stream-bed capable of vibrating, in which it can manifest itself without obstacle.

But the denser and harder the material mass became in successive periods of creation, the fainter became again the voice of this singing force. The ideal condition which characterizes the intermediate world was maintained in our material world only in musical instruments or in the human voice. And that is why, for the concrete world, the realm of music is the true area where spirit and matter, or heaven and earth, still overlap; in other words, the realm of ritual, cult, and the true seat of that sounding-power which stands behind all purely earthly concrete phenomena. In the last dream-image (third period of creation) the antinomic quality of spirit and matter and their various manifestations is

already there as seed but has not yet become irreconcilable contrast, because it is at bottom still a "finely grained" world, i.e., a world primarily effective through the dynamics of sound.

This purely ritualistic conception of a dualistic world, consisting only of the mingling of sounds and light-dark shapes and knowing as yet no irreconcilable contrasts, has been treated again and again, and with many variations, by ancient cosmogonies. In order to give these ideas pictorial expression, they showed the play of the cosmic powers (in the last analysis determined only by a purely acoustic antimony) at first by two intersecting or tangential circles. Since the whole world was conceived as anthropomorphic, into each circle a huge couple was drawn. Of these two antinomic pairs, one represented the spiritual, the other the material, world. The inner antinomy of these circles, each already antinomic in itself, was thus indicated by four persons. Each of these two giant couples is shown sometimes back to back, sometimes squatting, sometimes cross-legged, but in the last case in such a way that one head always points up while the other one hangs down. Consequently the two persons touch with their buttocks. In this way one person appears as the mirror-image or counterplayer of the other. Occasionally, the two couples were reduced to one, the upper part of the body filling the spiritual space, while the lower part formed the material. In this case the man stands upright, while the woman stands on her head.

Between these two circles is then inserted another pair of tangential circles into which a third couple is drawn in the same way. This third couple represents the region of that hybrid creature which is sometimes meant to represent the mediator between heaven and earth, sometimes the column supporting the firmament or the tree of life and death. In the four leaves resulting from the intersecting of the four circles lies the intermediate region, and around it the earth and the sea.

Let us examine this anthropomorphic world picture in detail, leaving out the mirror-image and looking only at the upper circle. In the middle rises the backbone, which with its ribs forms the tree and branches of death. In the mirror-image which we shall hence ignore, the backbone corresponds to the tree of life. In the dome of heaven which forms the large resonance-cave of the god of thunder are the lung and heart of the universe. Under the diaphragm (network of the sun) where the spiritual circle meets the material lie gall bladder (dragon's cave) and the so-called nephritic caves of the kidneys. The whole complex, rich

in caves, under the diaphragm is the so-called holy mountain, the center of which forms the navel of the earth, and under its roots (perineum) the two streams of life, Ida and Pingala (connected also with vein and artery), divide into four streams.

This whole cosmic system which emerged by imposing the structure of humans on the universe was, however, not meant to depict our present world. It was solely to point to that ideal intermediate world which in time as well as space formed the transition from the purely spiritual to the material world. Since man and universe are analogous, the development and construction of these finely grained original states of the world continue to live on, even today, in the archaic layer of mankind, particularly in myths, in dreams, and in the deepest unconscious of man, according to Indian teaching. In man, too, under the influence of the bright rhythm, the hazy acoustical basic substance of the unconscious gradually turns into a world of images, the coherence of which is determined not by logical but by musical laws. But since these antinomic images grow out of a dream situation, they have of course only an extremely vacillating meaning or no meaning which can be fixed comprehensibly and unequivocally. All the more does man experience them purely psychically and physically, that is, as motion and real event flowing through him, which he can master only by either forgetting this antinomic stream he seized in his dream or transferring it to a ritualistic symbol. The whole historical sequence (in the beginning an almost completely abstract existence: first in darkness, then in light, and finally in a half-concrete, finely grained state) which we were able to follow in the act of creation thus is repeated in the psyche of man. At first there was the incomprehensible, alogical, audibly or inaudibly sounding darkness of the deepest unconscious. Then the light of the singing dream-images appeared, and finally half-conscious life, i.e., the intermediate world in which our spirit arbitrarily shaped the material mass, not by formal and logical laws, but by irrational and musical ones.

In the twilight of the intermediate world (which is also the world of cult and at the same time the border line between the conscious and the unconscious) the symbol, too, developed. Here the blind dual impetuses, rising to the surface from the dark of the primeval or the depth of the human subconscious as pure sound-images, at last find the finely grained stream-bed formed by our spirit, which allows them to appear and to ring out in sound; for just as the sounding intermediate world

is still beyond any material splitting-up of force into various manifestations, the symbol, too, can still channel and master any force in its purest form, before the inner unity of the dualistic force dissolves in the light of formal thought and before the acoustical substance splits up into various material phenomena and thus cuts off man's access to it. For the awakened consciousness, however, and for the material world, the symbol is the concrete realization of a form originally expressing a spiritual energy which stood between the rational and the irrational world, between the world of logic and reason and the dynamic-musical world.

Thus the symbol is both stream-bed and justification for a force which dares penetrate beyond its own irrational sphere to the region of rational thought. The symbol seems to stand in an alien material world like a fortress sealed up on all sides. But in reality many underground passages lead to this center, from which there are direct paths to the depth of irrational life. The symbol is the protective cloak for all forces which are separated or split up into various forms in their material existence; under this cloak they reappear in their homogeneous basic structure—as the sounding images of the intermediate world or as ritual objects within the material world.

While in the course of this article we have learned to recognize purely pictorial, silent, or unmoving symbols as forms of a later style and sometimes as mere tokens for purely acoustic phenomena of the subconscious, perhaps we have discovered the most archaic and abstract layer of archetypes in the human unconscious and its dream-world. I am referring to that dynamic layer without images which extends from the elementary cry to elementary forms of song of a type found in equal distribution all over the earth, and one which is equally comprehensible to men of all cultures. This is a group of acoustical archetypes which, free from artistic formulation and cultural specialization, hardly attains the formality of melody but in most cases is extraordinarily full of effects. Their structure is usually most elementary, and their real character is determined above all by the psychological overtones which fill the hall, ranging from screams of joy about the singing to lamentations and weeping.

It is in the instability of the phenomenon outlined above that the antinomy of the unconscious is able to attain its most thorough fusion,

blending, or interlacing. Nothing corresponds to the archaic-bestial darkness and the fluid boundaries of the forces of the unconscious so well as the imageless and conceptionless antinomy of the sound phenomenon: the simultaneity or unnoticeable transition from laughing to singing and crying; the consonant or dissonant chords of contrasting (high and low, hard and soft) tones; or the alternation of rhythmic forces with the uninterrupted change of tonal functions.

But even more highly developed music has a place in this connection. It does not, of course, belong in the realm of the cosmic primeval, but it does belong in the intermediate world, in the zone of the half-conscious in which the intellect is already framing and inclosing the life of pure instinct.

Now, so long as sounds are considered the basic substance of all phenomena (cross-section), the tool which we call "symbol" will also have to be a sounding tool. But from the moment in which the image emerging from the sound is considered equivalent with the sound, the acoustic symbol can gradually be supplanted by a sound-image, i.e., a concrete, visible, pictorial symbol.

Among dream-images based on sound and preserved by mythology we have first the dark image of a moist, foggy, murmuring mass out of which rises the sound of the primeval waters, according to Indian lore. In the beginning the sounds of this mass are unstable, fluid shapes which, depending on their relative distances or rhythms, are in consonant or dissonant relation to each other, whenever they do not simply co-exist chaotically. This amorphous dark murmuring, which is considered the zone of death, is ended by the bright rhythm which through alternating arsis and thesis, or short and long, creates order in time and space and stamps a definite form on the mass. There are numerous images in mythology which seem to correspond to the dualistic development of this original sound phenomenon: the dark, amorphous sound is taken as the original form of water and earth or of a female element. Rhythm, imposing order and form, on the other hand, is the prototype of air, bright fire, masculinity. But both parts, sound and rhythm, are again antinomic in themselves: sound by the simultaneity of high and low, rhythm by its floating accent. The acoustic phenomenon, moreover, includes the pre-forms of all later categories: space through the pitch of the tones, time through their duration, intensity through volume,

quality through tone-color, and changing combinations of tonal functions while maintaining a steady meter.

The central images mentioned most often which are the result of the rhythmic organization and stabilization of the fire-water-mass are the milky way, the volcano, and the singing light-tree or concept of the giant. Closely connected are the pictures of caves, hollow trees, and the prime mother or prime drum, the original acoustical form of which is a non-material precipice or sounding board from which the tone grows up as the first power of cosmic being. The imperative voice, the sound of a waterfall or thunder, becomes the picture of an authoritative person. Noise is turned into fearful or evil shapes. The sounds of nature produce corresponding figures. The most vital characteristics of an animal are combined in the nature of its cry.

It seems strange to us today that the acoustic phenomenon always was to have preceded the visual. But if we really want to understand the ancient symbols, we have to go back to the beliefs of the old civilizations which created these dream-symbols, whether we like it or not. According to these beliefs, the acoustical always precedes the optical. Chinese cosmology tells us explicitly: first came thunder, then lightning. Behind the view is doubtless the concept that cosmic life since the creation of the intermediate world (seen chronologically, since the climax or noontime of universal life) has gone backward. Consequently, in contrast to the constructive primeval times, all events in our time unroll in the opposite direction. This is the only way in which we can understand the role of the symbol in the ritual. It stands at the noon of creation, i.e., it represents the balance between the rational and the irrational.

All more highly formed music has an equal intermediate position. Gods who ride over the waters as singing feathers or ride through the air on neighing horses or drums, who swing axes which return to them like echoes—all these figures which defy natural laws and have the peculiarity of floating in the air, contrary to the law of gravity, turn out on closer examination to be sound pictures by which the dream, or mythology, makes visual the abstract event of dynamically floating song.

Let us pause a moment to outline once again the two kinds of symbol we have recognized so far. The oldest symbol, we must assume, was

the figure of a singing person who conquers the antithesis of the I and you or of the here and the beyond above all time and space by making himself the immediate carrier (stream-bed) of these anthitheses by means of the acoustical border, or dream, substance. By lending his own voice to a magic power, in order to let this power speak through him, he also obtains an immediate share in it.

Another kind of symbol is created when the acoustic phenomenon which, through the act of creation, embodies in germ form and dualistically the substance of all appearances and all antitheses of the psychic and the material world. This occurs when the phenomenon is clothed in dream-images in which the dreamer carries out his actions indirectly, for instance, through a musical instrument or the mythological form thereof (*drum* = body, vessel, ship, sled, horse, chariot; *harp* = hook, ladder; *flute* = bamboo-cane, bamboo-bridge, scepter, phallus. A *strange calling voice* = rope, along which the dreamer feels his way). In this type, man is functioning as symbol, as channeler of the power flowing through him, only in his dream. But when upon awakening he consciously makes a symbol out of the images experienced in his dream, he is no longer himself the stream-bed because now he is looking at his experience objectively and casting it in the form of a symbol outside his own body, a drum for instance. The symbol is now only a tool in his hands; consequently he can feel its power only through an object outside himself.

In order to supply this dead material object created after a dream-image with a truly living symbolic power (conquering antinomy and cross-section), a new factor has to be introduced. The material from which the symbol is made has to be *holy,* and this holiness is what makes it sound. A sacrifice, then, must take place. Whereas, with the sounding symbol, man offers himself as the sacrifice and is made holy by giving his voice (his most valuable substance) as stream-bed to the force to be channeled, the visual dead symbol calls for a material which is the result of a sacrifice already made. A holy stone, the bone of a dead creature, a piece of wood, or a skin inclosing the life of a sacrificed being must be made to sound, for magic power flows only where a sacrifice has prepared the way.

An example of such a material is the Amerasian frame-drum which is supposed to be an image of the whole world. A Chinese myth tells the following tale: A hero is killed in the ritual manner. He is skinned,

the skin is tanned and dried and stretched over the frame of a drum. And now the singing power which the dead man had during his lifetime is changed into one much more powerful—the sound of a drum-skin beaten by a living person. But in this sounding symbol of asceticism and unlimited power the primary thing is no longer the sound but the dried skin from which the sound rises. The drummer is no longer the real stream-bed, or symbol, but only the intermediary who causes the sounding power, latent in the skin, to begin to roll out. For this reason the drum is also regarded as sled, chariot, or riding animal.

This material tool, by which man tries to find entrance to a magic power without the direct offering of his own person, brings us to a turning point at which the formation of the silent symbol becomes possible. The next step consists of setting some rite expressing the antinomy of living forces in a concise formula, without regard for the acoustic cross-section of the symbol, leaving it to the intellect to complete the cross-section. The place of the sacrifice is taken by consecration (which is to make the symbol capable of bearing by word or song) and by the custom of ritual-singing in the presence of the symbol. From this moment, however, the symbol is no longer a real psychophysical stream-guide but only a bearer of meaning, composed more or less arbitrarily or developed historically and consequently only more or less accessible to man, depending on his intelligence. Whereas the symbol now acquires a very definite meaning, it is also uprooted from its true alogical sphere; and it is only in this way that we can explain the wealth of meanings, sometimes completely heterogeneous, of many symbols of the later style. The symbol of the old style is an expression of a definite spiritual attitude, not the abstract formulation of an abstract idea.

5. MUSIC AND DREAM

We shall now return to the acoustic primary symbol, in order to pose the question: To what extent is this acoustic primary, or border, phenomenon as basis for the symbol still comprehensible today, despite the historical evolution just mentioned (priority of the optical and intellectual over the acoustic)? I think there is no doubt that even we still hear voices or other more or less definable sounds in our dreams. But the question how far man today experiences this dream-music as the real substratum of his dream-images could only be answered by a corresponding study of dreams. We can certainly still experience a voice in

its primary form, i.e., as the purely acoustic expression of a person, without necessarily connecting it with a visual image of the person. But how far we are able to experience a voice still as a purely psychic condition—having no connection with or reference to a definite person —this, too, only the study of dreams can answer.

Much more common, doubtless, is the obstinate recurrence of a melody and its occasional linkage with an equally obstinate dream-image. In the dreams of primitive peoples, on the other hand, pure sound-images are the usual thing. It is a commonplace notion among primitive civilizations that the dream is, in fact, the source of musical inspiration. The Baule and Duala Negroes assured me again and again that even the pictorial images of the singing dead heard in dreams were at first experienced acoustically and were only gradually seen (dancing to the rhythm of the song). The Dualas say that living men, animals, or trees, even mountains, appear to them in dreams as pure melodies, sometimes light and misty, sometimes oppressive, but always incorporeal and "transparent." Five individuals whom I asked separately for the meaning of these melodies gave the same answer: "This melody is man, or animal, or tree," or "The melody is the strength of man, of animal, or of the tree, but it is hard to remember these melodies exactly when one is awake. They also lose their power easily when one sings them before another person." Still, there is a fairly large repertory of such songs which the composer first heard abstractly in a dream and only later gradually recognized as image.

If for further enlightenment on these processes we again consult the cosmogonies of the East we are led to suspect that the gradual dawning of light in dreams is caused by the desire to tear sound from its dark, objective existence, to make it visible and comprehensible by bright rhythm—yes, even to take possession of it in a palpable way. Just as the gods (sounds) of primeval times became visible and then gradually wanted to become heavy and corporeal as well, so does dreaming man perhaps want to transform the purely acoustic foundation of his unconscious into visible and palpable figures.

However, in our dreams things often appear in a kind of *ostinato* or rondo form, and in a shape or manner of moving which seems to defy all natural laws. Many dream psychologists are of the opinion that these extraordinary forms of motion and figures serve the dreamer as escape from the everyday coercion of physical laws. But in this very

tendency of the mind to remove a single event from its material conformity the connection of dream-images with their acoustical foundation becomes quite obvious again. It is, in fact, a specific attribute of music to have at its disposal an incredible dynamic and tectonic freedom in the composition and repetition of a melody. Perhaps this freedom of the acoustical dream-substance is what underlies the aesthetics of many modern painters. Melodies, at any rate, can be turned upside-down without loss of individuality or vitality or can return as mirror-image or backward. It is also possible to let any one part, for instance the "head" (first theme), return in the middle or at the end of a movement, even sequentially ebbing and flowing. Moreover, several melodies can sound at once, entwine and cross over or pursue each other as canons and thicken into an inextricable ball. Counterpoint and bitonal parallel voices, i.e., the simultaneity or union of two contrary or analogous voices, are a fundmental law in musical voice-leading. The ambiguity of dream-images, too, finds its counterpart in the changing meaning of tonal functions. The dream-technique of veiling or altering meanings or of connecting quite dissimilar objects on the basis of phonetic similarity (a classical example: "geschickt" means both "sent away" and "physically well-co-ordinated") returns in music as enharmonic or enrhythmic phenomenon. These phenomena, which in normal life at best are considered the product of an extravagant imagination, are in music the natural form of motion.

There is no limit, either, to the variety of individual images which can be produced in the listener by certain tone-colors and forms of motion. Such images may, of course, be the result of the imagination merely playing on the surface of the musical event. But when the sound of the horn breaks in muffled depths and then suddenly appears above us in unsuspected heights and completely changed voice, when the pipes of pan sound as if the wind were rustling in the porous bamboo stalks of a pond, or the drum rhythm seems to rattle down on us like hail, then the formulating powers of our unconscious are sometimes forced to fight for pictorial expression which is not to be confused with the urge to play that I mentioned earlier. Such a picture, which may present itself during a particularly strong acoustic impression, is really due less to a tendency toward sound-painting than to a compulsion to rid one's self of a musical impression of excessive vehemence. Escape into the realm of the optical is often a flight from the incom-

prehensible and primeval of the acoustic impression flooding us, just as awakening can be flight from the impressiveness of a dream.

A short theme is capable of bursting its framework, like a bowl of fruit out of which a melody uncoils, now contracting its body, now stretching it boundlessly like the mythical cloudsnake. No less overwhelming is the music of black magic, the cursing song spreading death and evil spells or calling up the sound substance of amorphous monsters. It is through chaotically ringing, whistling masses of sound and convulsive or torpid rhythms that the creative sound substance is changed into an amorphous event. Noise and screams come to life as horror figures. Unless man tames these chaotic masses in the bright rhythm of the intermediate world, the realm of sound can virtually turn into a prehistoric titanic monster, a dragon with seven heads who lurks with seven dreadful screams in the twilight in a narrow pass between the conscious and the unconscious. It was only because the spirit of man was able to master this mass that he was able to make the primeval world his own.

The chaotic and polyphonic knot which corresponds to the spirit of our unconscious is prevented from unbridled eruption, and can even be turned into redeeming symbol, by well-ordered rhythm, or spirit, which clasps this chaotic mass and forces it into a fruitful partnership.

And yet the forces of the primeval world remain active, for something sinister—the nameless and ambiguous, escaping all comprehensible stabilization—still continues to cling to every specifically musical sound phenomenon. Just like the dream whose inexorable logic is incomprehensible to the logic of our mind, music is the abstract expression of the irrational and apparently chaotic primeval growth and the drive to unlimited multiplication by obstinate repetition.

It is obvious that the acoustic phenomenon we are discussing refers especially to that archaic sound phenomenon which we find particularly in genuine primitive music as uninhibited expression of the unconscious. This expression is accomplished with primitive peoples the more easily, since all possibilities of sound-making and sound-movement are permissible and are not hemmed in by rules of the craft. Not only can shouting, howling, whistling, and imitations of any natural noise be woven into the song; their rhythms, too, move much more freely, are more varied, and more faithful to nature than the formulas codified in constructed music.

Of course it is also possible for genuinely symbolic sounds to issue from the inspiration of the composer. When Wackenroder refers to such music as the mirror of the soul, this corresponds in large part to the old conception of the sound symbol. But when such music starts from purely spoken diction, or wants to express an idea by sound-painting, then it no longer produces genuine sound symbols but, rather, symbolic sounds, i.e., musical sounds which are to take the place of a pre-existing spoken sentence, a picture, or an idea. With this symbolic sound, music has taken the decisive turn, after which sound is no longer the elementary given substance but has become a secondary incarnation of the picture or idea. Its foundation is no longer the unconscious, smoldering in sound and gradually struggling through to a visual image, but a conscious image searching for a suitable tonal event. Nevertheless, the tonal symbol retains the advantage over silent symbols by using material which is fundamentally closest to the inner substance of every phenomenon and thereby continues to suggest the channeling-power of the ancient symbol.

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Hildebert Isnard

VINEYARDS AND SOCIAL STRUCTURE IN ALGERIA

Picture a vast territory whose soil is peopled by European colonists, while military conquest places the natives in a position of total dependence. Settlers from all parts of the parent state and from other countries as well form, at first, an inorganic mass of families arbitrarily placed side by side and differing from one another in all aspects as to place of origin, mental attitudes, habits, way of life.

This population of immigrants takes root only if it is able to draw profit from the possibilities latent in its new milieu. The success of colonization depends then on the development of a sufficiently remunerative system of cultivation. When the technical problem is resolved, this economic basis provides the foundation for developing the structures needed for the organization of a society. First come the productive returns which are to transform the former landholders into agricultural workers and which will create a hierarchy among the colonists according to their personal qualities or their individual luck.

Around the pole of growth constituted by agriculture, systems of communication and other forms of activity are developed. Regular commercial relations are established between the parent state and its

Translated by James H. Labadie.

colony. Soon appear the specific institutions of a society which has attained its majority. The hold of this society on both environment and men is henceforth complete.

We have attempted to analyze this process of colonization of peoples in the study of a particular case, that of Algeria, where it has been visibly taking place for just over a century. The facts are well known. It remains for us to put them in order. Our study, in other words, is less a monograph than an example designed to illustrate a thesis.

It has been said that the day of the grape has come to an end in Algeria. This is correct if one means that the prohibition by law of new plantings, in effect for more than twenty years, has removed all possibility of expansion. Statistics even show marked decreases. But the cultivation of the grape has created structures which have conditioned the existence of modern Algeria. Although overshadowed by other current problems, these structures not only continue to exist but resist the application of new solutions.

Not since 1830 has the economic history of Algeria unfolded in a continuous rhythm generated by its own dynamics. It has known small revolutions, sudden mutations if you will, which have been in one way or another imposed from outside. In an extreme oversimplification this history may be reduced to three principal phases.

The first, a period of successive attempts all equally unfortunate, lasted a half-century. It opened with a mistake for which the blame may be assigned to those in charge at the time and for whom "colony" was identified with "tropical country," the "exotics," as they have since been derisively called. Among them, General Clauzel boldly advanced the idea that "sugar cane, cotton, and coffee will thrive by themselves in Algeria; cocoa will be easily obtained and indigo, carefully cultivated, will soon adjust to the climate." Less excusable were the technicians: A. Hardy, pupil of the Museum and director of the Jardin d'Acclimatation at Algiers; Moll, member of the Société Royale et Centrale d'Agriculture; and the eminent members of the Société d'Agriculture d'Algérie, who outdid one another in extolling the rich possibilities of a colony "capable of providing our market with low-priced sugar, indigo, cotton, peanut oil."

Sugar cane, cacao, and coffee never went beyond the stage of feeble attempts. Cotton was more successful while the Civil War temporarily eliminated the competition of the United States from the French market. In 1876, however, the plantations had disappeared from the departments of Algiers and Constantine; in the Oran region they covered only 204 hectares.

Tobacco, greeted with the same official optimism, picked up where cotton left off. "The moment cannot be far off," declared the chief of a mission touring Algeria, "when our ports, rivaling those of Baltimore, Richmond, New Orleans, Fiume, Trieste, and Rotterdam, will see their ships setting out to carry tobacco to all the peoples of Europe." This scheme had failed by 1860, and, disappointed by the results achieved, the state tobacco monopoly decided to reduce its purchases from the colony. Then flax had its turn. But there was not enough water for the retting vats, and the opening of the Suez Canal favored Indian competition.

This time the situation seemed irremediable. The settlers were forced to renounce the hopes raised by projects for large-scale cultivation of industrial crops and to be content with the meager resources of grain cultivation as traditionally practiced by the natives. A perspicacious observer notes that "all the European exploitations have conserved the Arab system, the most miserable of all systems of crop rotation. The rotation of grain planting and lying fallow, practiced by all, is the most striking trait of the barbarous condition of Algerian agriculture."

By 1880 the colony was on the verge of bankruptcy. "It is time to face the fact," declared Saint-Marc de Giradin in the *Journal des débats,* "that this naturally unproductive soil will never repay the capital and the work expended upon it by the European."

An accident was to prove this prophecy false: the wave of phylloxera which was then sweeping France. It is not exaggerating to say that Algeria was at this moment saved by an insect.

The day of the vine had arrived. Why was it so late in coming, since, owing to the rapidly increasing European population, the colony had been forced at great expense to import increasing quantities of wines and spirits? While there had been no official prohibition of grape culture, there had, however, certainly been no encouragement. So long hypnotized by the promises of rich tropical crops made by all the authorities, the settlers did not consider the creation of extensive vine-

yards, which require heavy capital investment before yielding any return—all this with no certainty of being able to export to the metropolitan market.

Suddenly in 1880 the situation was reversed. France had to import considerable quantities of wines at the expense of its trade balance. She then discovered the possibilities offered by her Mediterranean possession and launched Algeria upon the creation of replacement vineyards. Previous failures had prevented the colony from building up credits. This made no difference. French capitalism, which had so far been little interested in the colony, stood ready to provide the necessary funds. It took over the Algerian economy and sought fruitful investments; which it found in the exportation of its funds either to foreign countries or to the colonial empire. Large sums were made available by the Banque de l'Algérie, the Crédit Foncier d'Algérie et de France, the Crédit Lyonnais, and the Comptoirs d'Escompte. This availability of low-interest loans went to the heads of the settlers, who had for a long time been able to borrow only at usurious rates. They planted, and planted more, endlessly. They ignored such crises as the outbreak of phylloxera in 1885 and of sales without profit owing to rapid progress in the reconstruction of French vineyards. Overcapitalized Algerian grape production was not always able to meet its obligations: bankruptcies, liquidations, and expropriations multiplied to the profit of the creditors. The first World War interrupted this pioneer phase. The point must be made that the vines of the colony at this time covered 155,000 hectares. Conceived as replacement vineyards, they tended more and more to become basic productive vineyards. The violent crises of overproduction which marked the first decade of the twentieth century prove that they had even become competing vineyards. Wisdom dictated no further expansion.

But expansion took place. No sooner had postwar balance been established than new plantings were made at additional expense, with redoubled vigor, owing to the fact that the threat of restrictive measures had been disclosed in advance. A "galloping production" followed which, from 1929 to 1935, brought the total of Algerian grape planting to its maximum figure: 400,000 hectares.

The inevitable happened, as a new period of overproduction began in 1929, with the crisis reaching a paroxysm in 1934 and 1935, when, in two successive years, Franco-Algerian wine production exceeded 100,-

000,000 hectoliters (2,500,000,000 gallons)! Measures taken by the government to remedy this tragic situation included, among others, the halting of new planting. Bound by this Draconian statute and by its integration into the French customs union which closed off the possibility of export, the Algerian wine industry, along with the whole colonial agricultural movement, found itself at an impasse.

Meanwhile the Moslem population continued to increase at an extraordinary rate, with corresponding needs for new employment opportunities. Algeria lacked both the imagination and the means to provide them. Then came the second World War. It was not until 1946 that France inaugurated her politics of development and modernization for overseas economies. The third phase of Algerian history then began —that of industrialization. But industrialization did not find an open field for development. The Algerian wine industry had prepared for it a Procrustean bed in the structures it had erected.

It seems to us that the results of the *Statut Viticole* in Algeria have not been sufficiently stressed. With traumatic results, the *Statut* brutally halted a development and upset a balance. The colonial society, so recently marked by extreme mobility, was stabilized, fixed, ripened in but a few years, at a moment when expanding Moslem society was violently shaken by what might be called the dynamism of its youthful nature. More than ever these two adjacent societies followed opposing courses. The complex Algerian problem, half-hidden up to this point, was to be fully disclosed.

This is, of course, an unexpected hypothesis which calls for an explanation.

The *Statut Viticole* has been blamed for the stagnation of Algeria's colonial population, which increased by fewer than 100,000 inhabitants from 1936 to 1954. If freedom of planting had been maintained, new immigrants would have arrived, and the relative strength of the native and colonial communities would not have been so unfavorable to the Europeans.

This is a serious accusation. Unsupported statements are not sufficient. The facts must be carefully analyzed.

We have first the assertion of Jules Guyot in 1880: "The cultivation of grapes is that which has the greatest colonizing force; . . . it attracts population." From 1882 to 1911, the years of greatest expansion in the

wine industry, the European population of Algeria rose from 410,000 to 780,000 inhabitants. Spokesmen of the time all believed in a cause-and-effect relationship: in twelve years, according to one of them, "the vineyards attracted 100,000 settlers." It is difficult to find this enthusiasm convincing.

The extraordinary increase in planting took place at the same time as the Third Republic's vast plan of official colonization. From 1871 to 1900 the administration settled nearly 50,000 families on about 700,000 hectares; in addition to these immigrants established on land concessions, others, perhaps more numerous, arrived in Algeria by choice, attracted by the various possibilities offered them for making a comfortable living.

Viticulture had nothing to do with the expansion of colonization outside its own narrow sphere: the upper plains of Constantine and the high Algiers-Oran plateaus, where the centers of European population were founded solely on the planting and cultivation of grain. In the very center of the grape-growing zone the cultivation of grain took up most of the land belonging to Europeans in 1911. With the help of new methods, it was beginning to bring wealth to the settlers, especially to those of Sidi-bel-Abbès. Thus the cultivation of the vine was not responsible for the great waves of immigration which marked the last quarter of the nineteenth century. But it certainly helped them. Many French vintners ruined by phylloxera left for the colony in the hope of a quick killing, after which they intended to return to France and reconstruct their insect-destroyed vineyards. Most of them remained in Algeria. We are particularly well informed on the Free Lyonnais colonization which took place in two areas of the department of Constantine, along the Gulf of Bougie and in the Plain of Bône. The colonists from Lyons were capitalists who found a worthwhile investment in the growing of the grape. The creative and exploitational work of a rapidly expanding vine acreage attracted to Algeria another category of immigrants: agricultural workers—Sardinians, Spaniards, Frenchmen—who were at first employed in plowing, preparation of the soil, and especially in vine-trimming and the work of wine-making. Some of these migrated temporarily; others remained in the colony.

Conversely, we must add that such wine-industry crises as phylloxera and the poor wine sales which broke out early in this development caused some settlers to return to the cities or even to France. Many who

were forced to liquidate their debts had to abandon their land to creditor banks. One observer writes that "many small growers saw themselves mercilessly expropriated and returned to the mother country with a feeling of rancor against Algeria." Peyerimhoff, in his *Inquiry* into the results of official colonization, points out the failure of Duquesne, populated by immigrants from Lorraine in 1875; by 1902 a handful of moneylenders had taken possession of most of their land. The senatorial commission presided over by J. Ferry recognized that the great vine areas of Oued-Amizour had been founded by a few owners who replaced the early concessionaires established with government help between 1872 and 1876. On the other hand, as the falling price of wine imposed severe limits on the amounts of money available for exploitation purposes, the settlers stopped calling for European seasonal workers and used instead cheap native labor.

A second phase of rapid expansion began in 1929. Between 1926 and 1936, dates of quinquennial censuses, the Algerian vinegrowing population of 111,000 individuals doubled. Six large cities—Algiers, Oran, Constantine, Bône, Sidi-bel-Abbès and Philippeville—absorbed over three-quarters of the increase, while small towns and villages accounted for the rest, fewer than 20,000. The regions which were given over almost exclusively to the cultivation of grain were generally depopulated: the high Constantine plains, for example, lost nearly a thousand Europeans, and the villages of the Sersou more than sixteen hundred. The grape-growing regions registered either losses, as in the Bône and Philippeville plains and the Jemmapes Basin, or slight gains, as in the Sahel near Algiers and the Mitidja Plain. Though the total rural European population fell from 237,000 to 230,000, the number of vinegrowers doubled. Where did these new planters come from? They were natives and long-established settlers who had abandoned the production of grain to seek greater security and stability in the vineyards.

Thus we see "the colonizing force" of the grape in its true perspective. While it is true that the continued spread of grape cultivation from 1880 to 1935 was accompanied by an increase in the colonial population, these two facts are in reality independent of each other. On the other hand, it must be admitted that the vineyards, unlike the discouraging cultivation of grain, consolidated the settling of colonists, rooting them firmly in the soil. Otherwise the rural European population would have

decreased. The counterproof? Since 1935 the vineyard area has decreased, and from 1936 to 1948 the rural European population fell to 201,000 inhabitants, a decrease of about 30,000 as compared to a loss of 7,000 in the preceding decade. With vine-planting blocked, the exodus speeded up, and the "European presence" in the Algerian countryside was weakened. For this the *Statut Viticole* is solely responsible.

But if the total European population, that of the villages as well as the cities, is today leveling off, it is due to the fact that the conception of colonization which prevailed from Louis-Philippe to the Third Republic has exhausted its possibilities. Algeria no longer needs new growers in its fields; the Algeria of tomorrow needs technicians, specialists, engineers.

This point having been made, it must be recognized that the culture of grape cultivation is that which most profoundly modeled and fashioned the colonial society of Algeria. It provided this society with what might be called its basic personality.

Let us remember these facts: the settlers' discouragement around 1880 and their bitter feeling of failure at that time. Had they not reached the point of believing that the only Europeans able to support themselves were those who, like the Spanish immigrants, were content with the native standard of living? At this point, almost overnight, came the unhoped-for chance offered by grape cultivation. The psychological shock brought a sudden change. With renewed confidence in the future, the settlers hurled themselves into planting with an enthusiasm scarcely checked by the early symptoms of crises to come. These sons of prudent peasants, accustomed to counting every sou, found themselves borrowing and spending without reckoning the cost at all; wealth was soon measured by the amount of one's debts. The situation favored the spread of the ingenious spirit of enterprise: the new planters would themselves resolve the problems posed by vine culture in hot countries; in a few years they perfected techniques and tools imitated in other countries. Algerian wines no longer deserved their poor reputation. Striking successes rewarded an exalted daring which was in some cases a real taste for risk; some individuals rose rapidly from the ranks to make huge fortunes. A comparison with the American self-made men of the same time is irresistible; among them was Charles Debonne, who landed from Malta in 1886 with nothing but a horse-

dealer's whip. With the chance to show his full measure as a man, he soon owned over 1,800 hectares of land in the Mitidja. The Banque de l'Algérie extended him 8,000,000 francs of credit. The government made him *Chevalier de la Légion d'Honneur* for exceptional services rendered to the cause of colonization. But by 1907 he had lost everything. For this society of speculating planters was extremely unstable; land changed hands often, and fortunes were made and lost in a series of crises.

This heroic period was brought to a sudden halt by the brutal effects of the *Statut Viticole*. Risk was succeeded by special privilege—the exceptionally remunerative exploitation of the vineyards. Protected by their exclusive rights, the vintners who could no longer hope for large loans and grants were now safe from the heavy risks of the industry's early days. The pioneers were succeeded by the bourgeois, jealously guarding their legal advantages, bitterly defending their class interests, ready at every moment to demand state help and protection as their rightful claim. After having been progressive, even revolutionary, cultivation of the grape became a very conservative enterprise.

The first fifty years of colonization, marked as we have seen by vain attempts and disappointed hopes, had seen the realization of a sort of static social integration, according to the expression dear to Gunnar Myrdal, among settlers nearly all of whom lived the same sort of life. For a few large landowners "wearing yellow gloves" there were thousands of small holders, poor hardworking men, equal in the mediocrity in which the cultivation of grain bound them with little hope of escape. There were thousands of "poor whites" with a standard of living so close to that of the natives that, through a process humorously compared by E. F. Gautier to "metamorphism of contact," their mental attitude was also close to that of the natives. Were not Europeans and Moslems mixing fraternally in those bands of wandering beggars, the Circumcellions (fourth-century martyrdom-seeking sect) of modern times, known as the "rolling army"?

It was to this stagnant population that the speculative cultivation of the grape suddenly opened its rich possibilities. Crises eliminated many of them from the competition, upsetting situations that had been thought permanent; individuals were classified in the process according to their luck and their aptitude. At the end, colonial society was organized, differentiated. Mobile and open for so long, it was to turn

inward as the *Statut Viticole* brought the evolution to a sudden halt. The only transformations visibly occurring today are those that take place within the society through the slow process of concentration of wealth.

As a structuring force, but also a segregating one, the vine cut the European agricultural population in two. On the one hand were the elect—11,500 planters of a total of 22,000. Most of the others had to be content with growing grain and raising sheep. Shall we measure the importance of the privilege? The first drew a gross income of at least 160,000 francs per hectare of grapes; the others, not more than 30,000 francs per hectare of the best land, planted in wheat.

But, although the average area of the individual vineyard in Algeria is 30 hectares compared to 0.85 hectare in France, the 11,500 growers are not all large producers. The latest agricultural census in Algeria revealed that, in 1950–51, 21 per cent of them (2,415) had small holdings of less than 10 hectares. They accounted for only 2 per cent of the 348,400 hectares of vineyards under European control, while 66 per cent of the total land so planted belonged to 3,235 holdings of at least 100 hectares, 28 per cent of the European growers.

There are then indeed European smallholders in Algeria. They are not very numerous, however, and it is the large planters who account for most of the surface area—exactly two-thirds. Concentration is therefore very marked; both individuals and companies have profited from it. There are about 150 of the latter, some organized on a family basis to avoid the scattered ownership which would result from inheritance problems; others, and these are the most powerful, belonging to French or Algerian capitalists. For example, in 1957, the Société du Kéroulis at Laferrière produced nearly 70,000 hectoliters of wine on a holding of 1,340 hectares—much more than most of the wine-producing villages of the Sahel of Algiers.

The grape has contributed largely to the mutual opposition felt by the two communities into which Algeria's pluralist society is divided. Unlike coffee, introduced by the settlers into Madagascar and the Ivory Coast and adopted, even monopolized, by the native peasants, the grape has remained essentially European. This fact is no doubt due less to the Moslem religious prohibition against the making of wine than to the impossibility of their obtaining the credit necessary for initial investment.

Although they had always planted vineyards for the production of grapes, the natives participated but little in the earliest plantings; in 1914 they owned only 4,000 hectares of vineyards. Through a sort of self-contradiction, it was the crisis of overproduction which brought about the natives' entry into large-scale planting of grapes. Particularly in the department of Oran, the Europeans encouraged and even helped the Moslems to plant the 10 hectares authorized by the law of July 4, 1931, for each individual, in the hope of later acquiring their crops and adding to their own total which was to be limited by the new law. Today 19,400 natives have vineyards covering 40,380 hectares, an average of just over 2 hectares. They form 60 per cent of the declaring producers, but they account for only 10 per cent of the total area under cultivation.

The often-repeated statement that viticulture contributed to form a native proletariat by depriving the Moslems of their land is not true. The fact is that the settlers have generally established their vineyards as replacements for other crops they had themselves been cultivating, especially grain. The chief role of viticulture has been to transform the natives into wage-earning agricultural workers more and more closely attached to the soil left to them through the colonization process.

So long as most Algerian planting consisted of grain cultivation, which requires, on the average, but ten days' work per year per hectare, it could be performed by a family with the help of some day labor from time to time. These labor needs increased greatly with the introduction of grape cultivation: a hectare of vineyard requires eighty days' work per year, eight times as much as wheat. We have seen that, after first hiring European workers, the settlers relied more and more upon the mass of rural natives. The latter had to learn the techniques of grape cultivation and wine-making rapidly. Thus was formed what one press agent called the "admirable workers' army."

The call for manual labor resulted in migrations, in overpopulated poor regions, such as the Kabyl mountain area, within the European wine regions. Larger and larger battalions of Moslem workers came into the plains of Bône, the Mitidja, and Oran from which the settlers had removed the old landowners; some took up permanent residence; others continued to make the seasonal journey from their native countryside to follow the barley harvest or the picking of olives and of figs.

So long as the vineyards were spreading, offers of employment multi-

plied at approximately the same rate as the increase of the native population; there was even a time during the "galloping" period of planting when the settlers had difficulty in recruiting the needed workers. The *Statut Viticole* brought to an end this relatively favorable situation. Since 1953 the grape industry has always had a sufficient labor supply; the need has even diminished as the demand for price reductions has resulted in a higher and higher degree of mechanization. The rural exodus picked up in volume, but instead of heading for the vineyards, where there has been little demand for labor, the fellahin have invaded the cities, where there is no need for them. This pathological urbanization had begun earlier but first showed its disturbing elements in the census of 1936; the first *bidonvilles* appeared at about this time. Is it mere coincidence that the Algerian problem we have described also became serious at the same time?

After twenty years of stabilization one may ask what the colonial wine industry offers today to the natives it employs. The answer is, "A great deal." The native worker receives wages which often mean more than the necessary addition to his old family subsistence earnings; for most it is the only monetary resource. An exact total is difficult to fix. Recent studies, however, have set the number of days' work required by the vineyards at 30,000,000 annually and the total of direct monetary wages at 22,000,000,000 francs. It should at the same time be noted that this amount, although somewhat of an exaggeration in the writer's opinion, equals barely half the savings sent from France to Algeria by Moslems employed on the Continent.

Thus viticulture in Algeria has taken on the character of a highly colonial industry, contributing to both social and racial segregation. For the Europeans it means ownership of the vineyards; for the natives it means working for wages.

Viticulture has played the role which in Keynesian vocabulary is that of a "multiplier," that is to say, a driving force. It was as a function of its development, and to facilitate that development, that the economic substructure of modern Algeria was formed.

For a long time colonial development had to be content with slow and costly road transport. The construction of a rail network had been put off; only a few lines were in service. An over-all program, adopted in 1889, was carried out at the same time as the expanding grape planting,

and until 1892 the placing in service of new lines was rapid. Interrupted by a shortage of credit, construction was resumed in 1900, and then, after World War I, in 1922. With the network completed, all wine regions were linked to seaports. In the meantime, the latter had had to be expanded and equipped to handle an expanding tonnage of wines for export: 625 metric tons in 1879, 575,000 in 1914, nearly 2,000,000 in 1938. The shipping companies increased their fleets and organized faster round-trip schedules between Algeria and France. There is no question but that Oran and Algiers owe to the wine industry their development as important seaports.

Another benefit of viticulture was the institution of agricultural credit and co-operation in Algeria. We have already noted that the large plantings of the early phase had been financed by loans from the Banque de l'Algérie through the intermediary of the Comptoirs d'Escompte, which multiplied to distribute this "manna." Soon other banking establishments joined the ranks: the Crédit Foncier et Agricole d'Algérie dates from 1880; the Crédit Lyonnais opened agencies in the colony.

After the earliest wine crises, the Banque de l'Algérie, victim of its own imprudence, decided to close its windows to the settlers, but it consented to provide the necessary capital for mutual agricultural credit societies. These were made possible by the law of July 8, 1901. Algeria was soon covered by a network of local societies which gave low-cost loans not only for handling the harvest but also for initial investment.

The next crisis led to the formation of the first Algerian agricultural cooperative in 1905, the Dupleix cellar, which placed completed equipment for wine-making at the disposal of its members. Wine-making societies appeared throughout the country, thanks to the financial support of the local societies and of the colonial budget. Following their example, other producers founded wheat, tobacco, and citrus fruit cooperatives.

The creation of a large vineyard area involves multiple activities, some of which provide the means necessary for maintaining the vineyards themselves; others handle the by-products of fermentation. Thus it was that Algeria was soon provided with its first industries for the delivery of copper sulfate, refined sulfur, alcohol, grapestone oils, vinegars, oilcake, potassium tartrate, grape juice, and *mistelle* (partially fermented fruit juices), some of which are exported.

Let us add that the sale of the wine production had required the organization of a network of middlemen between the planters and the large French wine producers; the great number of traders, agents, brokers, and representatives who with their staffs had taken up residence in the colony made real commercial centers of several Algerian cities.

The true importance of the growing of grapes in the colonial economy will be seen in the fact that in 1907 it represented 43 per cent of Algerian exports. After reaching a maximum of 66 per cent in 1933, it dropped to 39 per cent in 1956. Without ever constituting a true one-crop economy, the vineyards have been the very basis of the Algerian economy for over a half-century.

The grape industry placed enormous capital sums at the disposal of the settlers. Intoxicated by their sudden success, some spent without stopping to count the cost: Armand Arlès-Dufour had a stud farm to satisfy his passion for thoroughbreds, while today some planters own their private airfields. Others indulged in further land speculation, increasing their holdings and planting more and more; self-financing rather than credit provided the necessary funds for the rapid extension of grape planting after the first World War. When the *Statut Viticole* brought this to an end, the settlers turned their attention to citrus groves and especially to urban real estate. It is regrettable that they were not called upon to participate in large-scale investment, which might have begun the industrialization phase ten years earlier.

As a privileged group among the settlers, the planters soon became aware of their common interest. Their solidarity was forged in the various struggles in which they engaged. It first expressed itself in their group effort against phylloxera in 1886; it was strengthened by the rivalry between colonial and metropolitan (French) wine production caused by years of lower sales: the creation of the Confédération Générale des Vignerons du Midi (C.G.V.) in 1908 was answered in 1912 by the formation of the Confédération des Vignerons des Trois Départements Algériens (C.V.A.). The latter became the organ through which the planters, organized as a pressure group, showed as much power in politics as in economics. The temporary secession of small and middle-sized producers in 1932 failed to weaken the C.V.A.

It was easy for the planters to exercise this power, since, from 1900 on, Algeria had been marked by their civic personality and by financial

autonomy: the responsibility of managing a total vineyard area of 150,000 hectares had facilitated if not hastened the development of the colony to a status of financial independence. From that date Algeria's right to direct her own budget through financial delegations was recognized. When it is written, the history of the assembly which ruled the country until 1940 will do much to explain the current situation. We shall merely mention that the institution of this assembly was based on the principle of representation of economic interests and ethnic groups. There were four electoral colleges numerically very unequal: settlers, non-settlers, Arabs, and Kabyls, each named a "delegation." The settlers' delegation, in which those elected by the grape interests predominated, soon took the lead. Many budgetary measures favored the wine industry. Going far beyond the limits of their authority, which had been carefully set by the legislature, the financial delegations never hesitated, in speeches and resolutions, to come to the aid of their constituents threatened by the South of France. The Algerian vineyards developed under the provisions of the customs union which was set up step by step by legislative action between 1851 and 1884; its production was freely admitted into France on an equal basis with French wines. However, this security guaranteed by free access to the great metropolitan market was not total; we have seen that it was periodically troubled by crises of overproduction the liquidation of which caused many resounding bankruptcies. Such security was also dearly bought, since the customs union included a requirement to buy in France at prices often higher than those on the world market and to use French ships operating at monopoly rates. This meant cost prices which would not have permitted Algerian agricultural production to compete with foreign markets even if these had been freely open to it.

Cut off from international competition, the Algerian economy found in the customs union a sheltering, storm-free haven. But it was also effectively prevented from developing its agricultural potential beyond the volume which could be readily absorbed by the French metropolitan market. This sort of economic Malthusianism benefited a privileged minority to the detriment of the general welfare. The Algerian wine industry adapted itself perfectly to the protective framework of the customs union; it is significant that the settlers called for budgetary autonomy without ever seriously asking for customs autonomy.

When the crises in sales were most serious, the customs statute was brought up for discussion, especially by producers of the South of France, who several times called for protection against Algerian competition, including import duties. The settlers always protested against the establishment of differential rules, alleging their patriotism, their rights as citizens, and their equal obligations. On their side, the government authorities never admitted measures of discrimination that might weaken the principle of the customs union. The cultivation of the vine contributed as much to making Algeria French, to assimilating the colony to the home country, as did the 1889 law of automatic naturalization. Economic integration was to be definitively achieved with the completion of political integration, for the latter implies the former. There is an ulterior motive for some in the catchword of Algeria as a "French province" like Alsace, or rather like the Languedoc.[1]

It was, on the whole, the establishment of the vine which fixed the broad outlines of Algeria's regional structure as it appears today.

During these various phases colonization peopled at first the coastal zone, around the ports of debarkation: Bône, Philippeville, Algiers, Mostaganem, Oran. Then it penetrated into the interior as far as the edge of the dry inland plain. This second push, less strong than the first, encountered watering conditions less and less favorable to agriculture, so that the density of Europeans diminishes rapidly as one passes from north to south.

Vine culture was to show the characteristics of this division of the land. At first the attempt was made to establish vineyards wherever there were settlers. But natural conditions, such as thick limestone deposits, soil that was too compact or too salty, excessive heat in summer, and late-spring frosts soon forced them back from the poorer regions of the interior, the high plains of Constantine, the Chélif Valley, the Sersou Plain. The European population was then concentrated along the coast. Not only was the established population thus consolidated, but new groups of immigrants were established there, as well as an increas-

1. On this subject see the remark of J. Ferry in *Le Gouvernement de l'Algérie* (Paris, 1892), p. 8: "They were no ordinary men, these intrepid Algerian planters who, despite usury and phylloxera, moved endlessly forward, wherever there was a road and a bit of arable land, planting their long rows of green vines . . . as if hastening to show, by this most French of all crops, that they were taking peaceful and definitive possession of African soil, in the name of France."

ing number of settlers who abandoned the backcountry in which the growing of grain was a risky venture and not very rewarding.

Thus the distinction between Algeria's façade and its vast hinterland was strengthened. The façade made of hills and littoral plains contains nearly three-fourths of the vineyard area and 80 per cent of the European population, most of them concentrated in the cities. The rest live in the country. In several regions European possession of the land is so complete that the natives are practically reduced to the role of agricultural workers.

But the façade should not delude us; the vineyards formed but a ribbon without depth. Behind this "deceiving façade" there is another and dramatic reality: the plains which nature destined for the extensive planting of cereals and the grazing of sheep, such as the upper plains of Constantine, where Rome, in ancient times, established cities and colonies. Today 32,000 Europeans extract a meager existence from the 40,000 square kilometers of the *arrondissements* of Sétif and Batna. Still more dramatic is the reality of mountains like the overpopulated Kabyls, the Ouarsenis, and the Aurès, where colonization is today represented by virtually nothing but its small cadre of government employees. In the vast steppes of the upper plateaus, near-starving shepherds, left to themselves, lead the life of another era within 200 kilometers of Algiers and Oran.

A real regional division exists in the distinction between eastern and western Algeria. This is a well-known fact today, but it would seem that viticulture's responsibility has not been sufficiently accepted.

Several figures are highly significant. In 1888 the first 103,500 hectares of vineyards were about equally divided among the three departments: 31,000 hectares in the department of Constantine, 34,500 in the department of Algiers, and 38,000, or 37 per cent of the total, in the department of Oran. But beginning with that date the region of Oran moved farther into the lead year by year: in 1914 it had 48 per cent of the Algerian vineyards; in 1929, at the eve of the "galloping production" period, 54 per cent; and in 1935, when Algerian planting reached its highest point, 62 per cent.

Between 1938 and 1955 the application of the *Statut Viticole* failed to stabilize the situation. The relative importance of the Oran vineyards continued to increase—from 65 per cent of the total to 69 per cent. During this period the total area of Algerian grape planting fell from 398,-

628 hectares to 376,994, a decrease of 30,634 hectares. The Algiers and Constantine regions lost 20,523 and 4,429 hectares, respectively, or 18 per cent of their area; the decrease in the Oran region was only 5,682 hectares—barely 2 per cent. Even more significant, the number of planters and purchasers of harvests fell by 989 in Algiers and 334 in Constantine, while increasing by 3,058 in the Oran region, which then had nearly 80 per cent of the declaring producers!

Every development made it appear as though the Algerian grape industry purposely tended to withdraw from the east and the center to concentrate in the west, where it remained dynamic. In the east it has been strictly localized in the maritime zone, the coastal plains, and hills which are closed off by the dense growth of the Kabyl Plateau. It is excluded from the upper plains of Constantine, which dip farther inland as closed basins. On both sides the Kabyl chains face two separate domains: in the north, as a façade, that of the vineyards sparsely populated by Europeans; on the south, that of extensive grain production and sheep grazing, largely of native population. In the west, on the other hand, the ridge line of the terrain bears far to the south, along the face of the high plateaus; vines and grain, in adjacent fields, extend across the whole arable Tell region as far as the Alfa Steppe. In Oran Province viticulture reaches its maximum penetration to the south—Aïh-el-Hadjar, 120 kilometers from the sea, at latitude 34°45′. Here colonial villages are found deep in the region of the nomadic shepherds.

The distribution of the European agricultural population shows the same imbalance: 16 per cent of the total of separate holdings in the department of Constantine against 45 per cent in that of Oran. There is one European for eighteen natives in the first; one for four, in the second. The east is a native reserve; the west, a European province.

These data explain the geography of the current rebellion. They form the basis for projects envisaging one possible solution to the problem as recognized since 1954 in a territorial division of Algeria between the Europeans grouped in the west, in the grape-growing half of the country, and a Moslem state located in the east.

Culture of the vine has ruled over Algeria so far—but it is now a thing of the past. The out-of-date structures instituted by that rule ought to yield to new structures brought about by the development of

an industrialization movement based on the exploitation of the Sahara oilfields. Then, and without threat to the economy, the reconversion of a large part of the land now given over to the vine will be possible for the purpose of readapting Algerian agriculture to the interests of the total group.

Robert J. van Egten

HUMAN THOUGHT: NEW ORIENTATION DUE TO AUTOMATISM

FOREWORD

The modern engineer, because of his tendency to express himself in language which, even in reference to very simple things, systematically retreats into mathematical symbolism—strictly incomprehensible to the average man—enrols himself, unconsciously or deliberately, in a jealously closed caste in which those we call "technocrats" shut themselves up. This is the caste which seeks to be the sole elite and necessary heir of the former nobility in the new social "pattern."

Because I believe the engineer's "craft" to be one of the most beautiful in the world, I regret this hermetic attitude which tends to turn the engineer into a modern equivalent of the alchemist, thereby widening immeasurably the gulf which, in all eras, has separated scientific thought from the understanding of contemporaries, creating an almost impassible obstacle to the diffusion of knowledge. I also believe that the

Translated by Wells F. Chamberlin.

diffusion of knowledge is imperative for the survival of our civilization in tomorrow's terribly technical world.

My remarks are intended for cultivated readers, but for readers who are not technicians. I propose to discuss, in simple terms, things which are not always easy, because they are related to a new way of thinking which is itself complex. My subject will lead me to talk of machines which think, which judge, and which decide. I will be satisfied if I am able to persuade the reader that such terms are not hazy expressions which it is surprising to find in the writings of men who are in other respects apparently serious, but that the thought, judgment, and decision of the machine are things totally different from the thought, judgment, and decision of man, just as the way in which electronic calculators operate has very little in common with the methods used by man when he performs calculations.

ON RESEARCH

The scholar dear to the caricaturists of the early 1900's—dusty, absent-minded, and a bit ridiculous—has, during the last couple of decades, been transformed into a man who, when fitted into a team, makes child's play of manipulating forces on a universal scale and of manipulating ideas of a daring and a complexity which have no common measure with our forefathers' placid cogitations.

Yesterday's scholar deduced his discoveries from brilliant intuitions, using an experimental equipment which was generally derisory. Now the production of men of genius is, by the fact of the quantic mutations which determine the evolution of the human race, obviously an exceptional enough incident for the progress of scientific thought to have been, for a long time, an extremely slow process.

We have changed all that. We began by raising to a marked degree the intellectual potential of the masses, which allowed us to use a large number of specialists carefully trained in the various branches of knowledge. We then organized, systematized, and rationalized research within the limits of a concept of productivity copied on the model of industrial productivity, and we put into research the necessary men equipped with enormous facilities in tools and in machines.

We have not gone so far, as Carrel would suggest, as to impose a future career upon the child, at birth, by acting upon his organism through appropriate means so that he may become a perfect element.

It will probably be useless to go that far, since in the light of present knowledge we can surmise that in a non-utopian future research will be the function of machines, man intervening only to guide their action toward the end which he determines.

Atrocious? Not necessarily. The norms of our education postulate a fetishism of thought, a sort of deification of intelligence—that still totally mysterious faculty "which makes us doubt suddenly that which, up to that moment, we had accepted with our eyes closed,"[1] which permits that "man, turning inward, knows that he knows, thinks that he thinks, and deliberates about thinking,"[2] and which, "transcending ourselves, allows us to perceive ourselves in the act of perception."

It is human to deify what we do not understand, and there is no denying the fact that we do not understand the mechanism of thought or the mystery of our own existence. The difficulty arises, to cite Niels Bohr, from the fact that "we are at the same time the actors and the spectators in the great drama of existence."

Tell someone that he cannot be compared physically with the popular athlete of the day; it is likely that he will readily agree, and he may even make a speech on biceps-cerebrum incompatibility. But tell him that he is not very intelligent, and you will probably have made a lifelong enemy.

If we commit this sacrilege of separating the concept of intelligence from its vein of divinity, and if, along with the cyberneticians, we admit that intelligence is as mechanizable as our other activities, there is no reason, until the time comes when we can produce machines which really think, for our not organizing man's intellectual activity according to "mass-production" methods.

There are two aspects to scientific evolution. The individual of genius will be able, occasionally, to discover entirely new things, generally in contradiction with admitted truth. These discoveries often cause knowledge to leap forward because they are not a development of something which was already known. Here, the isolated scholar is irreplaceable, and it is worthy of notice that such discoveries are generally made by men who proceed by pure reasoning, using little or no experimental equipment. They are generally of a basic character.

1. McCulloch.

2. A. Valensin.

The other aspect is that of organized research, or "research centers." Here specialists in various branches of knowledge are gathered together; problems are outlined, aims are indicated, and, working in series, by a slow progression of minute developments, the researchers solve the problems within the framework of the aims. When these aims correspond to a necessity, an immediate need, the process is called "industrial research." When they do not correspond to anything which is immediately usable, it is called "basic research."

In conformity with the general tendency of this century to leave out the individual, the researcher remains, as a general rule, anonymous within the staff of the organization to which he belongs, and his name is only rarely mentioned upon the occasion of a discovery. We must realize, in truth, that the contributions of various researchers to the solution of a single problem are so dovetailed that it would be difficult to separate them.

Thus the research center comes to resemble more and more the factory, with its organization of the work, its production figures, and the anonymity of its personnel. These organisms have been said to be "invention mills," or even "engineer barracks," according to a friend of mine, a rather cynical industrialist.

Because the personnel of a research center have but a faint hope of seeing their personalities expand, there has been considerable talk of the "prostitution of values." But at that point I rebel; all we need do is to see on what tasks university people are sometimes used in industry to appreciate the meaning of such an expression.

In the spirit of our old ideas in which a certain nobility was attached to research, all this may seem disappointing; but, whatever nostalgia we may feel over it, we must bow to the evidence. It pays off. We must realize that the researcher or the isolated inventor is no longer easily conceivable, because modern scientific thought as well as modern technology are such complex things and require the utilization of important means that are not accessible to the individual.

If all that was required was an Einstein to establish the historic equation

$$E = mc^2,$$

it has, on the other hand, taken years of painstaking work by hordes of researchers and considerable outlays of capital before the Alamagordo bomb and the final atomic reactors were possible.

It pays off, because, without the unbelievable accumulation of researchers in innumerable units created under the pressure of industrial needs, favored principally by hostilities, it is clear that our science and our technology would not have reached its present level.

That explains the exponential speed of our evolution. It also highlights the tragedy of our era: the divorce of science and culture, of the researcher and the practitioner.

ON INDUSTRIAL PROCESSES

If we have been forced to submit scientific and technical research to the imperatives of production, it is fairly conceivable that this arises principally from our need to push to the maximum the efficiency of industrial processes so as to produce constantly greater amounts of consumer goods of better quality at a lower price. An extremely important aspect of technology has come from this: industrial automatism seen from the angle of cybernetics. The application is designated by a term of possibly debatable phonetic value but which, because of the passionate disputes it has evoked, has imposed itself universally, since it telescopes into four syllables a complex definition, a technique, and a mysticism: "automation."

It is not within the scope of this article to repeat the often-expounded history of the evolution with which we are concerned or to explain technicalities. Whether automation represents the second, third, or fourth industrial revolution matters little in itself, inasmuch as we realize that we are concerned in a very real way with a revolution. In fact, automation, which is, technically, a process of organizing industrial automatisms into an indissoluble whole, represents above all a way of thinking about these structures which is new and often difficult.

It is hardly necessary to say that, if our business enterprises owe it to themselves to reconsider their efficiency standards constantly, this is due, principally, to the social evolution and to the continual transformation of our conditions of life. A quick backward glance will measure how far we have come.

When marchionesses indulged in the innocent pleasures of the swing, they could, without immodesty, exhibit a fine leg sheathed in silk. But at least you had to be a marchioness, for that silk stocking implied immense resources. Today, the most humble of the working women we

encounter in our factories would feel irreparably dishonored if she were not flashing a pair of delicate nylons.

When, like veritable human cattle, men, women, and scarcely weaned babies were swallowed up at five o'clock in the morning in the textile mills, to emerge late in the evening, imagine the fate of the utopist, the dangerous, irresponsible dreamer, the madman who might have predicted the concern that industry shows for the worker today! Specialists are employed to beautify working sites and watch over the comfort of the worker, the work day has been reduced by half, time devoted to leisure may be estimated as more important than time devoted to work. After leaving the factory, the worker may go home in his small car to a house which he owns and may belong to powerful union organizations possessing their own banks, their own insurance companies, and their own industrial complexes.

When, about 1775, James Watt, who was then building his first industrial steam engines, could bore his cylinders on Wilkinson's new machine, the story goes that he went into raptures over the fact that nowhere did the boring error exceed 3 millimeters. Today, a set of automobile pistons is delivered, with its sleeves, with a tolerance of 2 microns on the running clearances. This has made the automobile possible for all.

A recent inquiry conducted in France for the *Express*[3] by the French Institute of Public Opinion gives the following results concerning the needs felt most keenly by eighteen- to thirty-year-old French citizens. To the question, "On the material level, are there things of which you feel yourself deprived?" the following replies were received:

	Per Cent		Per Cent
Vacation	42	Furniture	22
Automobile	39	Clothing	18
Amusements	35	Food	2
Household appliances	33	Others things	10
Housing	27	Nothing	10

And there we have it—the transformation in the conditions of life. It is a fact that the child born today already has, in fact or potentially, a sum of needs so great that to the eyes of the wealthy bourgeois living before the "first industrial revolution" it would have represented the

3. Maurice Lachin, "L'Automation au service de l'homme."

acme of an almost inconceivable luxury. It is because these needs must be met—and are met in advance—that the industrial problem arises.

This comfort and this sweetness of life, however exasperating existence may sometimes be, have been brought to us by the use of machines, and it is difficult to deny that, on the whole, humanity, industrialized peoples at the very least, is the happier for it. However, the evolution goes on, because, on the one hand, man is fundamentally always unsatisfied and because, on the other, there are still millions of men who go unclothed and hungry.

It seems at this point that the vein of the use of machines has been worked out: our machines have reached a stage of perfection such that they cannot very likley be further improved in any meaningful way. However, we must produce—always more, always faster, always better, always more cheaply—and it comes about that man, working with hands, muscles, and brain, can no longer keep up the pace. Consequently, it is necessary to free the machine from man.

But we must also give man more freedom from the factory. The cyberneticians have calculated that a man at work, whether he is a mechanic, a laborer, a calculating-machine operator, a chemist, a draftsman, or an accountant, utilizes only a minute fraction of his intellectual potential. Under such conditions work is a dull, insipid thing to which we are forced in exchange for our means of livelihood, and it is not true that this kind of work ennobles man. Equally untrue is the fatality of the curse on Adam, "Thou shalt earn thy bread by the sweat of thy brow."

Man is more valuable than that. Norbert Wiener, the father of cybernetics, has said:

> It is a degradation to a human being to chain him to an oar and use him as a source of power; but it is an almost equal degradation to assign him a purely repetitive task in a factory, which demands less than a millionth of his brain capacity. It is simpler to organize a factory or galley which uses individual human beings for a trivial fraction of their worth than it is to provide a world in which they can grow to their full stature.[4]

AUTOMATION

The balance sheet of an industrial cost price includes both direct and indirect labor as a considerable factor. "General expenses" contain a large

4. Norbert Weiner, *The Human Use of Human Beings* (Boston: Houghton Mifflin Co., 1950), p. 16.

share of it—salaries to maintenance personnel, wages for office personnel, salaries of staff and managerial personnel. Now, whereas the cost of labor tends to increase systematically, directly at first, then indirectly, from the fact of the constant reduction of working time, it develops that, in a parallel manner, the sale value of the manufactured item tends to be reduced in an equally systematic way.

On the other hand, the *raison d'être* of free enterprise is profit, and it is unrealistic to say that this is not the case in nationalized or community-owned enterprises. These are notoriously inefficient, and the profit is absorbed by payments to a generally plethoric personnel and by administrative gigantism.

Upon first analysis, the most obvious way of getting out of the dilemma is to begin by reducing the salary incidence according to the cost price (which leads to a reduction of the amount of labor absorbed by the manufactured item) and, finally, to eliminate the labor. In other words, it is a question of tending toward a state of affairs in which the factory can function quite alone; it is important, consequently, to replace man by calling upon automatic mechanisms which are to do his work, not only in what concerns his physical motions, but above all in the area of his noble functions: measuring, controlling, correcting, coordinating, calculating, judging, and deciding.

We thus come quite naturally to the point of imagining entities which resemble man, having man's gestures, his reflexes, and his thought—entities which we would place before our machines to guide them as man guides them today.

"We are, at present," says Culbertson, "in a position to construct automatons which, in all possible cases, would have the reactions which, in the same cases, Mr. Jones or Mr. Smith would have."[5] But he hastens to add: "We could build them *if* we had enough separate parts available, *if* we had enough time ahead of us, *if* our space were not at a premium." If we used separate parts whose size would average a cubic millimeter, the synthetic Mr. Smith would probably have the proportions of Notre-Dame of Paris, and it would take an army of installers several generations to assemble him. And Culbertson concludes, as the pure mathematician he is: "I shall not be concerned for the moment with these technical details. We shall always be able to study them later; I propose, for now, to establish a method for building robots."

5. J. T. Culbertson, "Some Uneconomical Robots."

The installation of robots—less perfect ones, certainly, than those of Culbertson—in front of each of our machines would be possible, probably spectacular, and certainly very "science fiction," but totally absurd. Notoriously, man does not constitute the best possible machine; there is, consequently, no sense in trying to copy him. What is more, why try to produce synthetic men when the production of the original model, assured by an infinite number of artisans of doubtful competence, is so abundant as to threaten to engulf the earth?

Now our machines have been conceived as a function of the human operator; they have been designed to adapt as well as possible to man's form, to his normal gestures and reflexes. The screw-cutting lathe, for example, assumes its familiar form quite simply, in view of bringing the work level within reach of the man's hands. In the automatized complex it is possible that this lathe may be reduced to a revolving tool, hidden somewhere in the bowels of the complex machine.

If we want to take a few steps in the direction of the "manless factory"—which is technically possible right now, but whose probability, for evident economic, social, and material reasons, lies in a still-distant future—it is important, within the framework of cybernetic thought which proposes to "make action efficacious," to rethink basically the *whole* business enterprise, the present structure of which is obviously based on man.

And, moreover, the expression "rethink the enterprise" is inexact; it is necessary to rethink each one of the actions which come together in the activity of the enterprise, from the direct action which acts physically upon the product and modifies it, to such indirect actions as those which, to give concrete examples, assure the planning of stocks in such a way as to produce the circulation of materials and products which feed the direct action, making it possible and efficacious.

Let no one be deceived by this: automation is only in a very accessory way a matter of machines, however automatic these may be individually. It is self-evident that to instal one, two, or ten automatic machines in the shops of a factory has in itself only a minor and secondary influence on the over-all balance sheet.

This point will never be sufficiently emphasized: automation does not consist in signing a few order forms which will produce the installation of a few new machines here and there in the factory, somewhat according to the whims of inspiration. In the same way, for example, the

electrification of a railroad system is not effected by ordering a few electric locomotives which will be dispatched, for better or for worse, over the line. Everyone knows that the electrification process implies a basic reorganization, a complete revision of the norms, means, and conditions of exploiting the system.

And we must also stress this aspect: the necessarily fragmentary automatization of a complex is an operation which pays off only relatively well and which is very costly, but it constitutes the easy way, easily carried out and easily understood. Automation, on the other hand, implies a study, preliminary to any execution of plans, of a basic character, and which is long and difficult—if you want to derive from the operation all the benefit it promises. I think that it is necessary to emphasize this, at the risk of becoming boring, for, as we all know, an emergency exists. Now it is generally agreed that the preliminary study for the construction of a new plant takes, in average cases, from two to five years and that the figure varies little according to whether the study is made in the conventional frame of reference or according to the norms of automation. But the study preliminary to the conversion of an existing enterprise also requires a minimum of from two to three years. The table of technical specifications relative to automation easily runs, for an average installation, from one to two thousand pages, not including diagrams.

For the moment, most industrialists seem to be retreating into a prudent expectancy, a policy of wait and see the dangerous attitude: "We don't want to move in too soon; let the others go ahead." However, when one of them decides to "go ahead," it is understandable that he will not be so charitable as to inform his competitors of his intentions. As a result, when he puts his "automated" factory into operation, he will have assured for himself, along with means of exploitation of an unprecedented efficiency, an advance of two to three years during which he will be permitted to sweep the markets for his own benefit. Moreover, since automation implies a highly increased production, it is imaginable that he will hardly be inclined to grant licenses which would permit his competitors to copy his achievement.

At the 1955 Margate convention a delegate summed up the situation in a clean-cut manner: "There is no point in asking ourselves whether automation will bring in more or less lush profits; it is important to decide now whether, by adopting automation, we will be able to fight

with some chance of success to keep our place in the sun, or whether, by not adopting it, we shall close our factories. It's as simple as that."

That is simple, neat, and clear, but it places a formidable problem before active industry; it implies that we must either go out of business or rethink to a fundamental degree,

> not only the whole of our manufacturing processes, but also all the organization of the business enterprise, from services of supply all the way to sales, and including production and maintenance services and the new services of technical correlation. We must shake up profoundly what we have, and this must of necessity be done by stages, so as to permit the factory, during the conversion period, to continue to produce with the old means, and also so as not to have to proceed in rapid succession to mass discharges of personnel. And it is not enough to reach the point at which the machines turn all by themselves. Generally, we see in automation only a means for reducing the labor force, and we forget that the savings thus effected, if they remain appreciable, will be largely offset by the new maintenance service. The forces of this new service will be on a level of technical education which has no common measurement with the personnel we now employ.[6]

Nothing would be more false than to imagine that automation constitutes a method for effecting economies—the kinds of economies which we begin to make systematically during a depression period and which are of the same class as those which have resulted in the proletarization of so many middle-class families. As a man of experience has proclaimed: "savings on equipment cost a business nothing—nothing except its future and its chances of survival."[7]

It would be impracticable to discuss here the complex plan of a factory, or even of an automated production line, because it is of too technical a nature. However, so as to make felt the manner of thinking which presides over these installations, I want to show, for example, how an operation which has been rethought from the angle of automation is transformed. The operation is here isolated from the rest of the complex to make the demonstration clear.

In the synthetic textile industry, at the end of the manufacturing circuit of the fiber, there is a manually controlled hydraulic press in which the product is compressed and baled; the bales are then manually weighed, numbered, classified, and warehoused. The question is asked about automatizing this press, which, because of the very large relative volume of the non-compressed fiber as it leaves the final dryers, must form the bale in several steps.

6. The writer's "Le démarrage de l'automation."

7. F. K. Shallenberger, "Economics of Plant Automation."

Automatizing is, quite obviously, within the competence of mechanics who, tackling the problem, instal a few "micro-switches," some relays, and some pneumatic effectors. The press is now termed "automatic" because, controlled by a single man-team, whereas formerly it required at least four, or twelve, man-days, it carries out the various pressing operations all by itself. As a sign of the times we even go so far as to utilize electronics in the form of a photoelectric cell which detects when the bin is full.

However, the automatician proceeds in another manner. He begins by condemning this installation, which is uninteresting, elementary, and not very rational. Having said this, he begins to disturb everyone by asking questions. Little by little the questions bring out a state of affairs which is not without interest.

Textile fiber is an extremely hygrostatic material. For this reason, by agreement within the trade, the bales are sold at "standard humidity," which means that the real weight has no relationship to the invoiced weight. The fiber is brought from the final dryer on a continuous-conveyor belt. Its humidity content is, at this time, not fixed, and every five minutes a sample is taken and analyzed by the production control laboratory. The figures obtained are entered on a form opposite the date and the hour of the sampling.

In shipping, it is necessary to indicate on all accounting forms, customs declarations, waybills, etc., each individual bale with its identification number and real weight. Laboratory forms provide the humidity ratings which were noted at the moment the bale was formed and make possible calculations, individually for each bale, of the theoretical weight at standard humidity which will be invoiced and will form the basis of the transaction.

After digesting these bits of information, our automatician, who had rather mysteriously disappeared from circulation, reappears one fine day, stating that he is not bringing in the best possible solution because, anxious to limit the expenses involved, he has sought to re-use to the maximum the existing equipment. Then, after a moment of silence, intended to give his listeners an appreciation of how reasonable he is, he proceeds to the outlining of his project.

Immediately above the press he instals electronic equipment which constantly measures the humidity percentage of the fiber. On the press bed he instals a weighing device, also electronic, which reacts upon the

controls of the press in such a way that it will turn out bales whose real weight is linked to an electric size which determines the adjustment of the machine. At the same time a signal coming from the humidity-index measuring unit constantly revises this electric size, so that the press produces bales at a variable real weight but at a theoretical weight which is at constant standard humidity.

It follows—but those are details, he says—that the press is adjusted in such a way that, without any intervention, it manufactures bales without interruption as long as fiber arrives in sufficient quantity over the conveyor. It also follows that an elementary mechanism (have I mentioned that our automatician lumps indistinctly all that can be added entirely on the outside of the system under one and the same term: "elementary mechanisms"?) assures the automatic baling and banding and that there is scarcely any problem in going ahead in such a way that the traveling bridge crane which runs into the warehouse will return and pick up the bales as they are finished and will take them to the warehouse.

Taking advantage of the fact that his listeners are strangely silent, he continues on the momentum of his first blast and observes that there is no longer any reason to number the bales and that the tiresome filling-in of innumerable forms becomes useless; that the control laboratory is freed from its equally tiresome analyses and that consequently it can use its personnel on more serious tasks; that the system as a whole is more accurate than manual operation and that there is no reason for not stepping up the cadence considerably; that, since in any case the traveling bridge crane is equipped with automatic controls for putting the bales into the warehouse, we can easily add to it magnetic-tape equipment which will have it bring out of the warehouse the bales required for filling an order and set them down, in routing order, on the waiting trucks.

No doubt he will want to add that the coding of the magnetic tape can be done by automatic accounting machines which fill in the forms and that, at the same time, the data—the information—can be fed into the ordinator which establishes the stock planning, the production planning, the state of the factory report, etc. But he will probably say nothing about this, for he is somewhat wary of the reactions of those around him who have a curious propensity for becoming flabbergasted when he explains such simple and obvious things to them.

Although this is not immediately visible, the installation presents certain important technical problems. However, in the mind of our automatician, none of this is very serious; such things are "installation incidents." What is important is the process of logical organization of interdependent automatic sequences which leads to a coherent, highly overlapping whole, with a functioning which is accurate, rapid, and entirely automatic. And that, even on the elementary scale of this example, is automation.

It is indeed worthy of notice that the whole installation presents one of the characteristics of partial automations: from the beginning, extensions toward future automatisms have been anticipated. When the time comes, it will be only a matter of linking them up. Right now the traveling bridge crane and its coded-tape control, the ordinator, etc., can be tied in. But, if you look carefully, you will find somewhere on the junction panel a group of unmarked terminals which arouse the curiosity of the installers. On the master plan these terminals are identified by the legend: "To Future Units."

You have already raised the objection that this is all very complex; and so it is. No one of us has ever stated that the new techniques were simple and easy, and the difficulty which many men feel in thinking in abstractions and in complexities is perhaps the greatest one encountered by automation in its effort to take hold. We must, however, resign ourselves to making a decision. Without reopening here the argument over the intelligence of machines, we must admit that automation utilizes automatic devices which are substituted for man as he exercises his intellect. However insignificant this may be at the present stage, we are applying processes which parallel intelligent activity. I believe that there is no hope of being able to achieve this by simple, rudimentary means, like those with which we have been able to get by up to now. We are headed for a world with an extremely complex technology; that is a fact, and we must bow to it. Better still, since ""bowing" contains a suggestion of passivity, it would be more realistic to say that, in response to this fact, we must prepare ourselves for life in the complex mode. Such a statement assumes its full value if we remember that it is becoming increasingly difficult to "get by" with the reasonings of conventional physics; each day it becomes more necessary to call upon the theories of relativity in the area of our current preoccupations.

Again I should like to call attention to certain aspects which it is important to keep in mind. As we go forward in establishing the plan for the automated business enterprise, we are forced to observe that gradually the analogy with the living organism is accentuated. And this is no mere figure of speech. Now, to admit that analogy as being a basis for valid reasoning is, quite simply, to espouse the cybernetic mode of thought.

ON CYBERNETIC THOUGHT

Everyone knows that cybernetics—the "crossroads science," to use G. Boulanger's vivid expression—was, in its early days, defined by Norbert Wiener as the science of "the entire field of control and of communication theory, whether in the machine or in the animal."[8] But upon examination it was rapidly shown that the implications of cybernetics are so infinitely vast that we can form an image of the cybernetician "which shows him preoccupied with a new form of thought still seeking its expression, but anxious also to produce, for the future, a synthesis of the living and the inert, based upon the deepest resources of culture and the most modern data of technique."[9]

It was therefore necessary from the beginning, in the interest of making realistic activity possible, to limit the areas in which, for the present, cybernetic thought could get a foothold in concrete things. Thus we have come—by analogy with the theory of relativity—to differentiate *limited cybernetics* and *general cybernetics,* limited cybernetics obviously including the area of industrial and technical applications.

From one of the general definitions: "The new way of thinking which, rejecting a priori any notion of a boundary line between living matter and inert matter, admits that, since the curve which describes the evolution of the machine is of more rapid increase than the one which describes man's evolution, the former, in time, will finally catch up with and pass the latter," we can deduce that cybernetics is "the methodology of action," the "science of finalized behaviors," or even "the art of making action efficacious."[10]

8. Norbert Wiener, *Cybernetics, or Control and Communication in the Animal and the Machine* (New York: John Wiley & Sons, 1948), p. 19.

9. Professor G. R. Boulanger, president of the International Cybernetics Association, "Opening Address," Second International Cybernetics Conference, Namur.

10. Various contributors, First International Cybernetics Conference, Namur, 1956.

In the area of general cybernetics applied to human societies such concepts require, to give a concrete example, that we say what there is in common between a sewing machine and a union defending fishermen;[11] and a common term does exist between them. If we keep in mind the fact that an action is never initiated except to attain a goal and that incontestably the fishermen's union has as clearly defined a goal as that of the sewing machine, the common term between the two examples is the action, which, to attain the goal, must be efficacious.

Returning to limited cybernetics, and consequently, to the plan of the automated factory, we are forced to note that the various composites of actions which we make automatic are finalized; that is, they are undertaken only to reach goals which, in their turn, are to be integrated into the *raison d'être* of the enterprise. And it is important here to be aware of certain phenomena. To quote Stafford Beer:

> A complete organism is a machine capable of maintaining itself in a disturbed environment only because it is coördinated. In each case, the objective is vital, despite a varied series of goals which are useful and sometimes contradictory. A business enterprise wants to earn the maximum profit; a man may want to get maximum enjoyment out of life; but neither of the two systems can adopt a strategy based on these motives alone.[12]

The system, under such conditions, can be brought to behave in a manner disastrous to its long-term survival. "The man," continues Beer, "may drink a quantity of whisky to seek pleasure, and may die of cirrhosis; the business can make a great deal of money by sacrificing its customers, and fail for lack of orders."

The goal of an automatic production line is obviously production. But, if "the action is efficacious," the production will soon go beyond all imaginable limits, and the line will have made short work of absorbing all the capital of the business in order to transform it into huge stocks of manufactured goods.

That immediately introduces the concept of "partial goals" which are to be integrated in their turn into a complex automated system which, within the limits of the "final goal," is to co-ordinate them. Here again it is important to proceed with caution, for one can easily imagine the exaggeration in which we may flounder if the co-ordinating complex is to control in detail all the individual actions. Returning to the analogy

11. L. Couffignal, "Science, technique, cybernétique."

12. Stafford Beer, "The Irrelevance of Automation."

with a living organism, again, according to Beer, this would imply that "a man would be fully conscious of each beat of his heart. He would rapidly become neurotic."

Thus it is important to subdivide the business enterprise into a certain number of organs, individually autostable within the framework of goals which, by their construction, they are obliged to attain with maximum efficacy—goals which are variable, imposed by a central automatic complex that itself remains stable despite the perturbing effect of the environment, and that tends with maximum efficacy toward its own goal.

Here again it would be straying far from my proposed limits for this article if I attempted to draw the reader beyond the rudimentary considerations which I have just indicated into the complex forest of cybernetic thought, which still has virgin timber in many of its reaches. I simply hope that the few notions which I have expressed justify to the reader's satisfaction the fact that, fundamentally, we are authorized to designate cybernetics and the branches of knowledge which derive from it as being "a new way of thinking."

ON THE SOCIAL IMPLICATIONS

We must admit, however overwhelmed we may be by our daily technical concerns, that we cannot help thinking sometimes about what will happen to the living matter around us—a living matter which, at least in principle, our activity tends to eliminate from our factories to a maximum degree.

It does occur to me to worry about what will become of Smith or Jones, whose usefulness will disappear as soon as, in a short while, a given automatic circuit is put into operation. For the moment, of course, the Smith problem and the Jones problem have nothing tragic about them. The persons involved will be put to work in other services which are still manual—but that does not alter the fact that this is a transitional solution, for, when conversions to automation are increased in those enterprises which today are reluctant to be in the vanguard, the Smiths and the Joneses, during a period of transition at the very least, will be legion.

Without doubt, the problem is formidable; and it is being watched, for in every circle it creates a deep uneasiness—even at times a kind of panic.

We find ourselves in the truly tragic situation of having to solve, quickly, problems which we know are imminent, which we sense to be serious, but which are unfamiliar to us, because we find ourselves faced with an evolution which nothing will stop, about which we can formulate hypotheses, but whose reactions we are incapable of predicting.

It seems possible to sum up the situation in the fact that we are going to be submerged by a crowd of Smiths and Joneses whose culture and training are too elementary to allow them to be of any use in the new factory. Moreover, it has become a commonplace to say that we are suffering from a lack of engineers (although, at the moment, that is not obvious when one considers the tasks to which the university-trained man is generally assigned in industry), and this lack is quite a likely possibility in the case of the future factory.

However, conditions have never been better or more imperious than they are today for allowing every individual, however little he may have to do with industrial activity, to increase his knowledge and to acquire knowledge of the new techniques. It is painful enough to have to remind people that this requires, on the part of the interested parties, a certain amount of energy and a great deal of interest, for many engineers must find themselves in the situation of one of their number who told me that, having left the university twenty years before, he had never since had either the leisure or the inclination to do more studying.

In sum, we find ourselves faced with a double problem. On the one hand, automation will work in such a way that we shall have to get rid of a certain number of men who do not have the requisite technical training; on the other hand, we shall have to hire technicians who will be experts in a field which is not that of the business enterprise's product.

Suppose we do "vertical integration"—a method which is now tending to spread and which consists in acting so that, in all areas, the business enterprise is self-sufficient. We have the raw material in the form of our present personnel to whom after all we do owe certain considerations, since in general they have served us for quite a few years and have accumulated an experience capital which, even if it cannot be used in its present form in the automatic factory, is nonetheless still valuable. Therefore, we are going to train this personnel in the new techniques.

It is important first of all to operate a selection which we are totally incapable of insuring in the present state of affairs, whatever the degree of efficiency of the psychotechnical services attached to the business enterprise. Consequently, we shall have to organize so that this selection may work spontaneously.

To make this clear, we can begin by systematically organizing information sessions to which the entire personnel of all types and without distinction is invited, and without—and this is important—any kind of attendance requirement. These sessions are graded so as to present increasingly difficult ideas, and the interested persons are explicitly told that dropping out during the course will never give rise to any pejorative personnel rating and that, on the contrary, they will be doing the business a favor if they feel they should not persevere in a direction which is difficult for them and which might prove to be poorly suited to their skills and particularly to their tastes.

By the end of the course a *de facto* selection will have been effected, and we shall have before us those elements for whom the strong possibility exists that they may be capable of receiving the most advanced technical training.

We will give them this training either through the factory engineers or through specialists hired on the outside and in the form of regular courses which will give those interested not only the rudiments of specific specialization but also the recall—or the teaching, if need be—of mathematics, physics, electronics, electricity, etc.

That will require from the business a certain organizational effort and an outlay of money, principally in the form of hours of work "lost," from the point of view of the manufactured product. This time, although not negligible, certainly does not represent a major item on the balance sheet, especially if it is likely that a tax exemption will be obtained on the amount of the worker's educational bill. That is likely, since it involves a service which can be considered as rendered to the community, the worker being assured that he retains his individual freedom even if on the very day of the conclusion of his studies he decides to take his newly acquired learning elsewhere.

In addition, nothing prevents us from considering that what has been spent in this way constitutes one of the most profitable investments which the enterprise may have had the opportunity to make for a long time.

I am under no illusion that these few general indications are the solution to the social problem which rightly concerns us. At best, they are merely suggestions within a limited area.

CONCLUSION

Because the large-scale application of modern techniques and of modern science, within the scope of a new way of thinking which is generally unfamiliar, is imminent and inevitable, it is important to diffuse this knowledge widely and without delay and to prepare ourselves intensively to face the situation. The thought that countries with as poorly developed but as excessive a population as China's, for example, are pushing automation intensively gives sufficient indication of what unforeseeable events threaten us—and these need not necessarily be armed hostilities. We must not delude ourselves, either, concerning the fact that, as soon as the protagonists of the two opposing ideological systems have had sufficient time, our present-day adversaries will become our most formidable competitors. And, if ever we shall have failed to insure that our industrial technology is maintained on the level of that of the "big powers," they will reduce us in our turn to the rank of underdeveloped countries.

We must be aware of all the aspects of the evolution we are living through, for, as we use the means which science puts at our disposal, we shall either proceed toward a world in which, as Norbert Wiener sees it, man will be able to grow to his full stature or toward one in which it will not be pleasant to live.

Because stagnation is a step in the direction of entropy, and because we have at our disposition the human intelligence which will gradually be freed from those sordid tasks that the thinking machines will perform, I believe that it is necessary to continue working with fervor at noble tasks. For however intelligent the machines may become, and however small, weak, inconsequential, and often stupid man can be, he still merits our faith in him and in his creative genius.

Jean Cazeneuve

TECHNICAL METHODS IN THE PREHISTORIC AGE

There has often been criticism of the use which was made by certain sociologists toward the beginning of the century (Lévy-Bruhl in particular) of the adjective "primitive" to characterize the level of culture of peoples whom we formerly called "savage." The term "archaic" perhaps creates fewer difficulties, but its etymology nevertheless involves the inconvenience of intimating that the societies in question might be closer to the origins than ours. Certain anthropologists, attempting to find an objective criterion which would permit us to draw a line of demarcation between the so-called primitives and ourselves, use the term "peoples without writing" to designate the former—that is, they refer to a technique. It is true that there might be good grounds for specifying this criterion. Indeed, graphic representation can consist of rudimentary signs such as one sees on the messagesticks of the Australians or in the sketched stories, such as those with which the North American Indian covered animal skins. We can speak of writing from the moment that definite characters of precise conventional meaning appear; but from the pictogram to the abstract sign there are still many

Translated by Wells F. Chamberlin.

transitions.[1] For example, in the pre-Columbian epoch, the writing system of the Aztecs "constituted a compromise between the ideogram, phonetism, and simple drawing."[2] Egyptian hieroglyphics were not yet totally freed from their pictographic origins. In the evolution which led to our modern system, the first step was taken when syllabic representation was adopted. But writing ceased to be reserved for specialists and truly became a widespread institution when the alphabet was invented; and that discovery, made no doubt toward the year 1800 B.C. by the Semitic peoples, came more than three thousand years after the first step. In general, the term "peoples without writing" does not in itself specify that it must be understood as meaning "peoples without an alphabet"; thus there is some doubt about civilizations like that of the Aztecs, endowed with a rather elaborate pictographic system. There would be good reason, moreover, to ask ourselves if the technique of writing really constitutes a reliable criterion for establishing a distinction between societies which stagnate in archaism and those which open up to history. Certain writers, such as Marcel Griaule or M. Gurvitch, would be inclined to refute it and to seek other technical criteria, such as the use of machines or reference to creative characteristics.

But in another way technology in general might be, of all the human sciences, the best founded for giving an acceptable meaning to the ideas of primitiveness and archaism, for it actually has the documents which allow us to go back to the true origins of the culture, precisely in the absence of any written trace. Not only is it through the vestiges of technique that prehistory informs us in any kind of non-conjectural way concerning the life of early men but also it is easier to classify hierarchically, according to a line of probable evolution, the different instruments used by peoples than to classify their achievements in other areas.

Indeed, it is by the comparative study of certain techniques of toolmaking that one is able to determine the stages in human evolution anterior to history. On this point, it is true, certain reservations must be made. Prehistory bases its chronology upon the materials it has available to it—that is, upon the tools which time has permitted to come

1. Cf. J. E. Lips, *Les Origines de la culture humaine* (Paris: Payot, 1951), pp. 206–10, and A. L. Kroeber, *Anthropology* (New York: Harcourt, Brace & Co., 1948), pp. 510–11.

2. J. Soustelle, *La Vie quotidienne des Aztèques* (Paris: Hachette, 1955).

down to us. Now it is certain that men, at the same time that they were chipping stone and perhaps even earlier, used instruments made of more perishable material—wood, for example. Nothing proves that the perfecting of these, from the stick to the bow or the boomerang, has always been on a par with that of flint objects; thus the classic differentiation among Paleolithic, Mesolithic, and Neolithic reveals only one aspect of progress and does not necessarily correspond to the more decisive stages in the development of technique. That must be borne in mind when, as several anthropologists have done, we seek to take the prehistoric schema as a model for a classification of archaic peoples living today. For example, if the Eskimo civilization reminds us in many respects of that of Neolithic man,[3] it occupies, on the other hand, a very high level in certain particular technical fields, such as that of clothing. This is true also for the Pueblo Indians in regard to pottery and the building of houses. We must recognize that it is precisely in the disparity of achievements according to different sectors that we find the great difficulty of any hierarchical classification of societies on the level of technology. Prehistory's imperviousness to this obstacle is based not on ignorance but on the fact that, in contrast to ethnography, it has a field of observation limited to the tools which the centuries and the millenniums do not destroy. Moreover, we are taking the word "prehistory" here in its narrow sense, since, truthfully speaking, the recent past of the pre-Columbian civilizations belongs entirely to prehistory in the wide but nevertheless precise sense of the term.

When we wish to study archaic technical methods in their entirety, and consequently to utilize at the same time the data of prehistory and of ethnography, we must, before any attempt at classification of the cultures is made, prepare an inventory of the different primitive techniques.

One complete and logical chart, which is often taken today as a basic reference, is that proposed by Mauss and which, by the vast field it covered, was in harmony with his definition, remarkable for its brevity: "I call technique an act which is traditionally efficacious."[4] After having

3. See, among others, C. S. Coon, *Histoire de l'homme* (Paris: Calmann-Lévy, 1958), p. 180.

4. Mauss, *Sociologie et anthropologie* (Paris: Presses Universitaires de France, 1950), p. 371. In his *Manuel d'ethnographie* (Paris: Payot, 1947), we find the definition of techniques as "traditional acts combined to produce a mechanical, physical, or chemical effect, acts which are known to be such" (p. 22). See also n. 34 below.

reserved a special place for physical techniques which,[5] like walking or swimming, presuppose only the presence of the human body, he classified in a first group the general techniques for general uses, such as the production of fire, the manufacture of tools; then he placed under the heading of special techniques for general uses, or general industries for special uses, basketwork, pottery, rope-making, treatment of glues and dyes; and, finally, he described in a third group the specialized industries for special uses: those of consumption, of simple acquisition and of production, of protection and of comfort, adding to them transportation and navigation.[6] M. Leroi-Gourhan has gone back to the general lines of this classification but has corrected and reworked it in several points. The basis of his over-all plan[7] was a division into three chapters: first, general techniques, subclassified in a new way, according to the means of the action and according to the materials to which these means are applied; second, special techniques, tending to transform nature; and, third, the pure techniques which uniquely and directly exploit the resources of the human mind or body. The same writer, approaching technology later from a slightly different point of view, divided this study into two principal parts. The first,[8] devoted to the means by which man makes something, reserved a special place for the means of transport but returned to the double classification of techniques according to the elementary means of action (percussion, use of fire, water, air, force) and according to the nature of the materials used (stable, fibrous, semiplastic, plastic, and pliable solids and fluids). The second part[9] concerned the techniques of acquisition (arms, hunting, fishing, cattle-raising, agriculture, mining) and those of consumption (food, clothing, housing). A study of technical methods cannot fail to

5. Mauss, "Les Techniques du corps," *Journal de psychologie* (1936), reprinted in *Sociologie et anthropologie*, pp. 363–86.

6. Mauss, *Manuel d'ethnographie*, pp. 22–68.

7. Leroi-Gourhan, "L'Homme et la nature." *Encyclopédie française*, VII (1936), 10:3–12:4.

8. Leroi-Gourhan, *L'Homme et la matière* (Paris: Albin Michel, 1943).

9. Leroi-Gourhan, *Milieu et techniques* (Paris: Albin Michel, 1945). It should be noted that the distinction between techniques of production and techniques of acquisition had been made by Plato, which shows clearly that it was already being used at a time when technique was still rather close to archaism (see P. M. Schuhl, "Remarques sur Platon et la technologie," *Revue des études grecques*, XLVI [July–December, 1953], 465–72).

profit greatly from these classifications furnished by technology and concerning the productions of technique, but it is not certain that such a study can adopt them entirely, for its subject and its point of view are not exactly the same. For example, there is manifestly a very great difference in method between hunting and cattle-raising, between fruit-picking and agriculture, which, however, are all to be classified under the heading of special techniques of acquisition. On the other hand, weaving, a general technique, and the special technique of clothing, imply methods which, without being identical, are nevertheless related.

Closer to considerations concerning methods, because they refer to *Homo faber* in action as much as they do to the technique which is its manifestation, would be the important differences emphasized by M. Bachelard between precise labor and heavy labor,[10] between the tools which are handled slowly and those requiring speed, or between those controlled by lengthy motions and, on the contrary, the instruments of brute percussion.[11] Anyone who has handled tools and done a bit of "puttering" will readily see, with Bachelard, that there are "mastery coefficients" which are different according to the material which one attacks and the mode of the attack. And the technical knowledge which is itself an act, a work of conquest, is certainly different according to the variations of this coefficient. What a long way there is from the rough chipping of a flint to the polishing of it! These are really two diverse aspects of the technical method.

However, the problem is complex, because for an identical type of tool the division line is not always similar according to whether one looks at its manufacture or at its use. Thus the use of the roughly cut Acheulian ax and that of the finely polished ax can be about the same if it relates in both cases to the felling of a large animal. If the object considered is no longer the ax but the animal, the distinction is rather to be made between hunting and cattle-raising. In both cases we see that it is not necessarily the consideration of the goal which matters here, since it is always a question, in the last analysis, of getting meat to use as food, and that it is nevertheless a long way from unskilled to skilled labor and from simple slaughter to patient domestication.

Technical methods are those of a struggle of man against nature. However, this struggle can take on the aspect of an aggression, or of a

10. G. Bachelard, *La Terre et les rêveries de la volonté* (Paris: J. Corti, 1946), p. 46.

11. *Ibid.*, p. 52.

clever annexation, according to whether man is content with wresting from nature what he needs or seeks to bend her to his desires and to make her docile. This distinction cannot, in any case, be substituted for the basic division among general, special, and pure techniques, but it must, especially in the field of archaic civilizations, be superimposed on that division or, rather, must cut through it perpendicularly. Indeed, a tool can sometimes serve the hunter as well as the herdsman, since it is obviously necessary that the latter kill cattle in order to eat them. And the same stake can serve for digging wild roots or tubers which have been grown.

On the other hand, as far as the instruments themselves are concerned, it is necessary to classify separately, as we have seen, the manufacturing techniques and the techniques of use. To construct a boat, you cut down a tree and hollow out the trunk, which is work related more to the art of forestry than to that of navigation. Similarly, the production of fire and its multiple utilizations bring into the picture very different kinds of technical knowledge.

In brief, the whole spread of technical aptitudes on the archaic horizon could be presented in the following way. Among the general techniques and the techniques of manufacture it would be necessary to distinguish from the point of view of methods those which are related to pure percussion and permit a simple, rough modification of the natural material and those which tend to shape, polish, fashion, and, above all, change the material. Obviously, it is often the material employed which suggests a given technique, as Bachelard has pointed out, so that this classification would coincide rather well with the one Leroi-Gourhan bases on the degree of solidity or fluidity of the materials. But what is important for the study of methods is the fact that, in one case, man obtains implements which do not differ essentially from what nature furnishes him, while, in the other case, he creates objects which are truly new. Thus the flaked or chipped piece of flint or the roughed-down stick is still a bit of stone or wood, while the vase is totally different from the lump of clay, and the basket is different from the reed. And, what is more, in making fire by friction, primitive man introduces something entirely new. In one case, that is to say, in what one might call "techniques of simple or direct manufacture," man takes the material furnished by nature, modifying it merely by gestures which are, although skilled and elaborate, nonetheless as natural as those of

striking or biting his quarry. In the second case, that is, in what could be termed "techniques of complex or indirect manufacture," *Homo faber* humanizes nature, as it were, and obtains completely new effects by accomplishing actions which are not at all suggested by any animal-like impulsion. Metallurgy obviously marks one of the peaks in this field, for it bends hard matter and subjugates it to the forms conceived by and for man.

As for the special techniques and the techniques of use, in which we must classify the pure techniques—those pertaining to the body in particular—they show, from the same point of view, an even sharper duality. Indeed, whether their goal is food, protection, locomotion, comfort, or pleasure, they imply different kinds of knowledge according to whether they tend to pillage nature or to domesticate it.

Thus, in a first category, linked to a method of *direct acquisition,* one might represent those techniques consisting by and large in taking things as they are offered by nature. If it is a matter of finding food, there are hunting, fishing, harvesting wild plants, gathering food from the ground, and digging roots. If he must defend himself, primitive man has war, in which he kills. For protection there is the use of caves and other natural shelters and the use of animal skins as clothing. As for locomotion, it is limited to the bodily techniques—walking, running, swimming. In a second category, characterized by the technical method which *organizes, bends, or subjugates nature* to the ends of man, the picture is quite different. Above all, cattle-raising and agriculture both contribute to feeding man. War no longer has as its aim to kill the enemy only but also to reduce him to slavery. To protect himself, man builds dwellings and weaves clothing. To move about, he has recourse to animal traction or to navigation. For personal comfort he has fire, which warms him and permits him to cook his food.[12] In sum, for the techniques of manufacture as for the techniques of acquisition, it seems that we may distinguish two types of methods. And, if we seek what may be in common between these two binary divisions, we perceive that it is particularly the time criterion which is indispensable in the case of techniques of manufacture and in those of acquisition. As far as the latter are concerned, it is obvious: the farmer

12. Plato made very clear distinctions, among the techniques of acquisition by capture, between those which are governed by struggle and those which procede by trickery. In the first, that is, in the area of violent acquisition, he placed war, hunting, and fishing (Schuhl, *op. cit.*).

who plows now will harvest only later the fruits of his labor, and the herdsman cares for an animal for a long time before eating it. The savage living by hunting and simple fruit-picking sees, as it were, no time interval between his action and the profit he derives from it. In the toolmaking field the same thing holds true. The polished ax represents a victory over impatience, a stretching-out of the technical time. It is no doubt because this slowing-down of action is contrary to natural impulse—for, in fact, it distinguishes human technique properly so called from that which merely prolongs animal behavior—that our ancestors first chipped stones instead of polishing them. Otherwise the evolutive order would have been turned the other way around. Indeed, contrary to what the layman thinks, it is more difficult to make a Paleolithic ax than a polished Neolithic ax. The former takes less time but requires a skill which is difficult to acquire.[13] The plurality of collective durations, on which Gurvitch has insisted, consequently assumes a particular aspect when it is materialized in technical achievements. This is the difference between the short duration of aggressive, quasi-animal technique and the patiently extended time of the technique which tends to shape and subjugate nature. The latter, insofar as both manufacture and acquisition are concerned, leads to establishing a typological distinction between the technical method of instantaneous or direct effect and the technical method of deferred or indirect effect.

Of course, this classification can be only approximative and cannot offer distinctions with clear-cut lines. And, above all, it is valid only on the level of archaic culture, where we find mingled together the technical method of simple or direct manufacture and of acquisition by force and the technical method of complex or indirect manufacture and of patient acquisition by a conquest which humanizes nature. However, this mixture can occur in variable proportions and balances, and we see that, from this point of view, archaic civilization shows different levels.

The notion of a unilinear evolution, marked out in the necessary stages, is easier for the mind to conceive concerning technique than it is for the other areas of culture. It is certain, for example, that the plow comes after the hoe and the swing plow and could not precede them in the history of progress. But this remarkable evolutive simplicity can

13. Cf. Kroeber, *op. cit.*, p. 629.

only be true, strictly speaking, for one kind of technique. When it is a matter of comparing one society to another, or of classifying different civilizations from the point of view of technique in general, one encounters difficulties with which, for example, prehistory does not have to be concerned insofar as it limits itself to a single criterion: lithic toolmaking.

Indeed, if we wish to compare archaic cultures with each other in the matter of technical methods, it would be vain to hope to establish a typology which is both general and strict at the same time.

In order to make a more thorough search for the elements of a typology of archaic societies from the point of view of the methods of technique, it would perhaps be advisable to go back to the first manifestations of *Homo faber* to see how his working activity is differentiated from that of the animal and how it is established little by little as truly specific.

It is not by the use of instruments and tools that we must characterize human technique, first, because we would thus eliminate the bodily techniques and, second, because certain animals have recourse to the use of tools. With them, however, it is a matter of specific, hereditary operating schemes or of occasional inventions, having no follow-up, depending on whether we are dealing with the manifestations of instinct or with the abilities of a particularly clever anthropoid ape. There are many well-known examples of this. They prove that the human technical method is characterized by tradition combined with invention.[14]

What were the first achievements of technical knowledge among the Paleo-Hominians? The *Sinanthropus* of Choukoutien possessed fire but probably did not know how to make it. The existence of a pre-Chellian lithic industry is still a matter of conjecture. But we do know that the oldest ancestors of man, going all the way back to *Pithecanthropus,* were already half-vegetarian, half-carnivorous. Consequently, they were hunters, and we can surmise that they could not have existed if they had not at least used stones or pieces of quartz to kill heavy game and clubs to knock out small animals and also to poke into the ground to dig up roots. If we next consider the upper Paleolithic man, tools, as Boule writes, could only tend "inevitably . . . towards a few

14. André Varagnac, in *De la prehistoire au monde moderne* (Paris: Plon, 1954), pp. 47–49, has aptly emphasized the importance of tradition in technical progress.

very simple ends—cutting, scraping, piercing,"[15] and toward making the blow of the human fist more efficacious. In the age of the mammoths, Neanderthal man, with the Mousterian industry of the mid-Paleolithic period, confines himself to perfecting the manufacture of flake tools by making a better distinction between the points and the scrapers. But in the upper Paleolithic period, while *Homo sapiens,* with his representatives from Grimaldi, Crô-Magnon, and Chancelade, is assuming his true physiognomy after the disappearance of the Neanderthalians, the industries include clearly specialized types: scrapers of flint, Aurignacian bone points, Solutrean leaf points, and, finally, Magdalenian sewing awls and harpoons of bone. It is probably during this period also that man learns to make fire. And, above all, this is the age of the great artistic creations, evidenced in the caves of Lascaux and Altamira. Still more recently Mesolithic man adapts himself to particular conditions of life: in a temperate and humid climate he works out Azilian and Tardenoisian toolmaking, as delicate as it is precise, while in the northern regions, to cut down trees and build boats and cabins, he makes the paring knife (*tranchet*), the pick, and the Campignian-type ax. There already existed at that time, as Varagnac says,[16] actual workshops producing carpenters' tools and hafted axes. We are at the dawn of a great change, and this era can be called proto-Neolithic. The evolution of techniques has still been revealed only by the differentiation of tools. However, technical methods all through the Paleolithic and even the Mesolithic periods in fact undergo no great changes except for two points: the production of fire and artistic creation (perhaps inspired, moreover, by preoccupations of a magic nature). On the whole, useful techniques remain limited to direct appropriation of natural resources: man kills the animals he hunts down, or which are captured in snares or caught in fishing; he digs up roots to be cooked; he dwells in natural shelters or protects himself from the wind by makeshift screens.[17] Perhaps, however, the Campignian men already knew how to harvest the seeds of plants in baskets in order to sow them —but they did not plow the ground. The big step forward was taken in the Neolithic period. That this term, etymologically, should desig-

15. Marcellin Boule and Henri V. Vallois, *Fossil Men* (trans. Michael Bullock from the 5th French ed. of *Les Hommes fossiles* [London: Thames & Hudson, 1957]), p. 149.

16. Varagnac, *op. cit.,* p. 59.

17. Lips, *op. cit.,* p. 12.

nate a new technique for stone tools is not without importance, for the polished ax marked, indeed, in the procedures of manufacture, a triumph for slow work over brute action and a concern for creating truly humanized forms. The simultaneous development of pottery and basketwork, more marked no doubt in the New World than in the Old, at the end of the period of pure and simple acquisition, is inspired by the same tendency to shape rather than to break. But it is the appearance of agriculture and cattle-raising which certainly constitutes the major contribution of the Neolithic. It is on a par, moreover, with modifications in the other industries. Flint, on the one hand, is in competition with harder rocks brought from a distance, and in the very working of flint a true division of labor appears which is particularly evident during the Robenhausian period. On the other hand, at the same time that basketwork and pottery, which quite probably also had their specialist-artisans, were being developed, the progressive abandonment of the nomadic life involves the building of real, if not comfortable, dwellings, such as the houses on pilings. Thus the principal techniques that we may observe today among peoples without writing are already all in place (with the exception of African metallurgy)[18] in the phase of prehistory called Neolithic or Holocene. And, moreover, the transition from the Paleo-Mesolithic to the Neolithic clearly gives the impression that the greatest change, insofar as technical methods are concerned, is effected at the time when man is no longer content to perfect the aggressive procedures of direct acquisition and of simple production but, on becoming a farmer, superimposes on them and gives preference to patient procedures which bend or subjugate nature to human ends and which are accompanied by complex or indirect techniques of manufacture. In the first phase, the human technical method seems to be differentiated from the possibilities of the anthropoid technical method only by the eminent role of tradition which permits improvements from generation to generation, but it is not differentiated by its orientation. In the atmosphere of the Holocene period, on the contrary, technical method seems to lose contact with animal impulse and tends truly toward humanizing nature.

If we now compare and collect into one whole the data of prehistory and of ethnography, we can ask what the elements of a typology of

18. Pre-Columbian metallurgy in America did not play a determining role in the whole development of techniques.

technical methods in archaic societies can be. We must immediately rule out not only the classifications which are entirely modeled on the schemas of prehistory[19] but also the traditional law of the three cultural conditions (hunters-fishermen, nomad-herdsmen, and sedentary farmers). The criticisms made of these typologies are well known and seem to be definitive.[20] In any case, it is clearly established that the domestication of animals, except that of the dog, has rarely, if ever, preceded agriculture. If we confine ourselves to the observation of technical methods, a binary typology suggested by prehistory (but nevertheless in no way dictated by the categories that prehistory justifies from the single viewpoint of the lithic industry) seems to avoid all these objections. Let us repeat that any typology (as is often the case in the human sciences) is valid only in general and that no society adheres perfectly to a category. What we can say is that there are two possible aspects to the technical method: one which consists, for man, in taking what is necessary to him, and the other which tends to humanize nature. And among the archaic cultures there are some which are dominated by the first aspect, and others by the second. What name shall we give to these two types, approximately designated? Certain technologists establish a distinction among "barbaric" peoples.[21] This term, which would be useful, unfortunately has a pejorative echo. Let us therefore simply use the term "peoples of primary stage" for those whose technical method is oriented toward direct acquisition and simple manufacture, like the Paleolithic men, and "peoples of secondary stage" for those whose technical method tends to humanize and domesticate nature through processes of complex manufacture, as was done in the Neolithic period. We mean here only the "dominant" characteristics of these cultures, since certain practices—for example, the production of fire—although they are complex and indirect, are known in the primary stage, an exception being made for certain peoples, like the Andamanese, who knew practically nothing of what belongs to the secondary stage.

19. E.g., the classification of Menghin in *Weltgeschichte der Steinzeit* (Vienna, 1941), which establishes a parallelism between the pre-Chellian culture and that of the Veddahs; between the Mousterian culture and that of the Tasmanians; etc.

20. G. Lucien Febvre, "La Terre et l'évolution humaine," in *L'Évolution de l'humanité* (Paris: Albin Michel, 1922), pp. 291 ff.; C. D. Forde, *Habitat, Society, and Economy* (London, 1934), p. 461; M. J. Herskovits, *Man and His Works* (New York: A. A. Knopf, 1948), p. 247.

21. Singer, Holmyard, and Hall.

With these reservations made, and they are important, can we hope to classify the "present-day primitives" according to the two types of technical methods, primary and secondary, with as much clarity as the Paleolithic is distinguished from the Neolithic? It is natural to place in the first category the hunting and harvesting peoples, such as the Tasmanians, the Fuegians, the Bushmen, the Pygmies, and the Australians, and in the secondary stage the farming Indians of the western United States, especially the Pueblos, the Indians of the great Central and South American empires, the Polynesians, and certain African blacks. On the other hand, for reasons we have given, we may hesitate over the case of the Eskimos and certain other peoples, such as the Indians of the eastern part of the United States, who tilled the soil a little but remained essentially hunters, or the Californians who, without practicing agriculture, improved the yield of wild plants by irrigation. And it would be necessary within each type to indicate precisely for a given technique the degree of advancement of knowledge. For example, concerning fire, there is obviously a great difference between the peoples who, like the Andamanese, preserve the flame as *Sinanthropus* did, without knowing how to produce it, and those who obtain it by striking pyrites together, those who produce it with great difficulty by groove friction, like the Tasmanians, and those who light it with more perfected equipment, such as the bow drill. Concerning lithic industry, the Pygmies occupy a place apart because they have so little of it; the Tasmanians have tools which resemble those of the Mousterian age and others which remind us of the Aurignacian; the Bushmen, like other African clans, seem really to be the direct heirs of the African Capsian, who corresponds to our upper Paleolithic man. But that does not change the fact that the Pygmies and the Bushmen have an effective weapon in the bow with poisoned arrows. It would also be necessary to make a distinction between the technique of hunting large game, practiced by these African tribes, and that of hunting small game, which, among the Australians, makes the boomerang very useful. As for agricultural peoples, their techniques can also show important shades of difference which we have already mentioned. The Pueblo Indians, for example, practiced irrigation on a large scale and with much success in the pre-Columbian period; but we must not forget that in all America, although the continent was a corn-producer, the plow was unknown, just as in Oceania. That does not alter the fact

that agriculture entailed among these peoples its full consequences, for example, the development of village handicraft and the construction of comfortable houses. Finally, the art of navigation has often evolved in an independent manner, utilizing a form of technical knowledge which is not always on the same level as that shown by the same people in other areas. Different circumstances can obviously explain this, for in an identical stage of technical knowledge we observe spectacular advances or delays from field to field. For the culture of the Eskimo, the very particular geographic environment explains many things. In a more general way, there can be no agriculture without arable lands, no metallurgy without ore. The natural environment also creates needs. Thus the cold obliged the Eskimo to dress warmly. But physical environment does not explain everything. The presence of ore does not create metallurgy. The Eskimos domesticated the reindeer, but the Canadian Indians did not know how to utilize the caribou in the same way. The American Pueblos were masters of the art of pottery, whereas the Maori of New Zealand made no use of the clay they had in abundance.

In brief, we can see that the typology which distinguishes two developmental stages in technical methods bears only upon the whole and does not rule out, in this or that particular domain, exceptions which are not always explained by the external circumstances. However, if one chooses within each of the two types characteristic examples of each stage, it is no less true that then the over-all differences are obviously applicable. Thus between the technical method of the Tasmanians and that of the Indians, what a divergence there is in orientation! The former take with great skill what nature offers them. The latter, as it were, use and consume almost nothing which has not been prepared for and adapted to the needs of man. If agriculture plays a determining role in this typology, it is because it functions at the same time as the school and as the evidence of the change in orientation. The growing of plants, as elsewhere the raising of animals, indeed implies a technical method markedly different from that of the hunter, fisherman, and gatherer, for it requires of man a victory over his natural impatience. His work is not immediately remunerative; he is controlled by foresight. It even implies the giving-up of what he could take immediately. This is in one sense not at all natural, or, if one prefers, it does not tend in the same direction as the technical invention of the

anthropoids, or, in a general way, in the direction of that of animals which are not guided by a complex instinct. Man practically turns his back on the impulses which appear in the techniques of the first stage. Clear proof of the difficulty of breaking with the first tendencies of technical knowledge seems to lie in the fact that one often has a great deal of trouble in bringing certain peoples who have remained in the first stage to adopt agriculture, despite all the advantages that it implies for them, whereas, on the contrary, they quickly and enthusiastically adopt new tools and instruments which do not involve such a change for them. Lips cites, among several striking examples, the case of the Bororos, traditionally hunters and pickers, to whom the Brazilian government gave ready-prepared lands, tools, seed grains, and food to live on until harvest time and who profited from the gifts by having a good time and by felling trees instead of cultivating the soil as they had been instructed to do.[22] In a word, the technical method of the second degree is distinguished from the other by the fact that it does not follow the natural impulse of *Homo faber*. It is reflective, patient, and organizing, while that of the first degree is intuitive, spontaneous, and aggressive.

After having distinguished the two principal aspects which technical method reveals in archaic societies, the next step would be to consider the method of the archaic techniques in its most general aspect, still within the framework of these societies. Its relationships with other human activities could thus be examined, so as to determine whether it is properly original or whether, on the contrary, it is reducible to other intellectual procedures with which we often see it associated (e.g., religion, magic, and science).

The fact that in many mythologies the inventors (demiurges) may be divine or quasi-divine beings, or rivals of the gods, could suggest a religious origin for techniques. Certain writers, Geiger, for example, have carried this theory quite far.[23] He, like Espinas, asserts that the wheel was first invented for ritual uses. Thus the first rotating instruments, in the Vedic epoch, served to light the sacrificial fire or to produce butter for offerings. The prayer-wheel is, he says, anterior to the vehicle wheel, and, even before men had the idea of cooking food or

22. Lips, *op cit.*, pp. 81–82.

23. Geiger, *Zur Entwicklungsgeschichte der Menscheit* (Stuttgart, 1871).

warming themselves, they were offering meat to the gods after having purified it by fire. Reubeaux[24] and René Hubert,[25] also citing the wheel and fire as examples, have defended an analogous thesis. Ruyssen has presented a judicious criticism, first, by showing that certain facts contradict the conclusions drawn by these writers from the Vedic documents and, second, by insisting on the absence of all mystic atmosphere, of all mystic arrangement of facts, insofar as simple techniques like that of the stone and the club are concerned. Over these man creates no problems for himself because he "literally sees himself working and succeeding," so that between his invention and the obtained effect "there is no room for the marvelous."[26] Finally, in the case of more complex inventions, aside from the likelihood that man did not get the idea of profiting immediately from the advantages they offered him, it is quite probable that the myths were forged after the fact to explain techniques over which men were still marveling and whose origin they had forgotten. It is probably in this way that the numerous legends concerning fire-making were born—certain of which, moreover, attribute this invention to events having no mystic aspects. Thus the Siberian Yakuts tell the story that an old man invented fire by chance while striking one stone against another for amusement. Often, too, the myth is worked out as an answer to questions which a curious mind naturally asks itself when faced with the results of a complex technique. Among the peoples who produce fire by rubbing pieces of wood together, we often find myths explaining how the fire was deposited in certain trees, from which it is later drawn.[27]

It is possible that in some cases it was on the occasion of the preparation of certain rites that practical discoveries were made; but that does not mean that they have a religious origin. For example, even if the first inventor of the wheel was the man who had conceived the prayer-wheel, in no way does that cause the technical knowledge to be derived from the mystic knowledge. It is as if, because the first fire-maker might have been, as the story goes in the Yakut myth, a man who did not

24. Reubeaux, *Cinématique*, trans. Debise (Paris, 1877), p. 77.

25. R. Hubert, *Manuel élémentaire de sociologie* (Paris, 1935), p. 127.

26. Ruyssen, "Technique et religion," *Revue philosophique*, October–December, 1948, p. 436.

27. J. G. Frazer, *Mythes sur l'origine du feu* (Paris: Payot, 1931), pp. 131, 273, 276.

know what to do with his hands, we were to conclude that the cause of technique is idleness. We must not confuse causes and circumstances. In any event, even if technique and religion are associated in the total social phenomenon, it is no less true, as Lecoeur indicated,[28] that the intentions and the interests of *Homo faber* and of *Homo vates* are not the same.

But the fact pointed out by Ruyssen, that myths flourish around techniques which largely and generally correspond to those which we have associated with the method of the second degree and not around the others—those techniques which are not a subject of wonder, their results being of the same nature as the premises and the action—is of great importance and develops logically from the very characteristics which have served us in distinguishing the two types of technical method from each other. We have, in fact, tried to show in another study[29] that anguish and mystic worry are aroused by the divine-will characteristic which emanates from every being, every thing, and every event which symbolize man's loss of his conditioning—in other words, that which measures the distance between animal nature and human nature. If that is true, we should not be surprised to see that the techniques of production or acquisition based on aggression or direct capture, which characterize the first type of method, do not generally have ritual or mythical extensions. On the contrary, inventions like that of metallurgy, which show man his capacity for demonstrating a technical knowledge of a different orientation, cause to well up in him the feeling of a contact with the divine-will element and bring in either religious rituals which project the invention onto a transcendant plane in order to justify it or defense reactions which are translated by interdicts. To the first of these two ritualistic solutions for the anxiety born of the technical method of the second degree belong the Promethean myths. These justify an invention having a divine-will appearance by projecting it onto the plane of the transcendant archetypical model and even by transferring the feeling of guilt to a hero who does the expiating, with all the rites which are found in this mythical atmosphere so aptly described by Roger Caillois.[30] As for the other solution, we can cite as

28. Ch. Lecoeur, *Le Rite et l'outil* (Paris: Presses Universitaires de France, 1939), p. 20.

29. J. Cazeneuve, *Les Rites et la condition humaine* (Paris: Presses Universitaires de France, 1958).

30. R. Caillois, *Le Mythe et l'homme* (Paris: Gallimard, 1938), p. 28.

examples the iron and the smith taboos.[31] And still we are speaking only of the techniques of manufacture. The mythical overtone of the technical method of the second degree is even more obvious in the area of use and of acquisition. We can think, for example, not only of agrarian myths concerning inventions but also of all the mystic of fecundity and of death and resurrection, which have brought many scholars to consider, and not without reason, that the birth of agriculture had created the framework of renewal which led to the great religions of salvation—with all the consequences which that represents, even in the history of morals. This subject deserves fuller development. We must limit ourselves to noting that the very study of the relationships between technique and religion leads us, not to see the second as heir to the first, but to appreciate more fully the difference between the two types of technical method.

The relationships of technique to magic are not of the same order, for magic does not propose explanations and etiological myths but claims to act directly upon nature and, consequently, establishes itself as a rival of technique. Whereas in religion the believer can obtain a practical result through rites and particularly through prayer only through the medium of a transcendant power, magic, on the contrary, consists in practices which are professed to be efficacious in themselves.[32] Like technique, it presents itself as a set of prescriptions. If magic has occasion to appeal to supernatural beings, to demons, these do not, like divinities, have their independent will but are scarcely more than figurations of the immanent power of the magical action. Therefore certain writers, such as Maurice Pradines,[33] have gone so far as to call this a "thaumaturgical" technique. That is a matter of vocabulary. However, it is more convenient and more in accord with current practice to distinguish magic from techniques properly so called by defining the latter as did Mauss. He, specifying the concise formula which we have

31. An inventory of these will be found in Frazer's *Tabou, les périls de l'âme* (Paris: Geuthner, 1927), pp. 190 ff.

32. Cf. G. Gurvitch, *Essais de sociologie* (Paris: Recueil Sirey, 1938), pp. 202 ff. (difference between the magical *mana* and the religious-sacred, based on the the opposition between immanence and transcendence).

33. M. Pradines, *Traité de psychologie générale* (Paris: Presses Universitaires de France, 1946), Vol. I, Part II, Sec. 2 (but this writer recognizes the fact that the claim to utilize the principles of magic as one would those of technique is based on nonsense [*ibid.*, p. 142]).

quoted, wrote, precisely to avoid this confusion: "The term 'technique' is given to a group of motions, acts, which are generally and for the most part manual, organized, and traditional, combining to reach a goal which is known as physical, chemical, or organic."[34] However, even when we adopt this narrower definition, the question of the relationships between technique and magic is not resolved. In the absence of identification, there may yet be affiliation or even a community of origin and principle. It is thus, according to Lévy-Bruhl, that the primitive mentality tends to understand all operations which have a collective character. When he thought there was a logical difference between primitive mentality and modern mentality, not only did he refuse, in answer to an objection of Louis Weber,[35] to find in technique a germ of rational and scientific knowledge hidden in primitive societies but also, as M. Davy has emphasized,[36] he conceived of the role of technique as a subordinate one. According to him, primitive men, while manufacturing implements according to procedures dictated by practice, immediately attributed their success to supernatural powers, not granting to secondary, mechanical causes a sufficient efficacy. For these people, he writes, "that instruments shall be well made is not the most important thing, but that they shall be successful."[37] Technique would consequently be inseparable from magic. Malinowski presented the relationships between magic and technique in a very different way, for he conceived of the latter as absolutely independent of the mode of knowledge described by Lévy-Bruhl under the term of prelogical primitive mentality.[38] Basing his conclusions particularly on his ethnographical observations among the natives of the Trobriand Islands, Malinowski believes that archaic peoples accomplish properly so-called technical operations in a very positive manner. Magic is not involved but is superimposed to the precise degree to which the success of the operations is not assured. Thus, among the Trobriand Islanders, naviga-

34. Mauss, "Les Techniques et la technologie," *Journal de psychologie*, January-March, 1948, p. 73.

35. *Bulletin de la Société Française de Philosophie*, 23d Year, No. 2 (April, 1923), p. 37.

36. G. Davy, *Sociologues d'hier et d'aujourd'hui* (Paris: Alcan, 1931), pp. 292–94.

37. L. Lévy-Bruhl, *Primitive Mentality*, authorized trans. by Lillian A. Clare (New York: Macmillan, Co., 1923), p. 306.

38. B. Malinowski, *Magic, Science and Religion* (New York: Doubleday, Doran & Co., 1954), pp. 25–26.

tion on the lagoons, involving no great risks, is carried out without any appeal being made to magic, whereas no one would risk going on the open sea without having recourse to magic.[39] Eugene Dupreel proposes an analogous interpretation of the archaic behavior by distinguishing between what he calls the "A technique," that is, "the aggregate of duly proved means," which makes success simply probable, and a "B technique," which is magical and is supposed to fill the gaps in the first technique by acting upon the margin of chance which the first admits.[40] To Malinowski's interpretation Lévy-Bruhl objected that, in societies other than those of the Trobriands, the use of magic is not at all restricted to enterprises of doubtful success.[41] Thus, among the Papuans of Kiwai Island, magic is no less indispensable for building a house than for building a boat. But Malinowski actually has clearly specified that the share which technique leaves to chance, to risk, and consequently to the action of magic can be very subjective. Thus in the Trobriand Islands the magician plays a great role in the cultivation of gardens.[42] This is not a very hazardous enterprise; but it involves a technique which is vital for this people and which, for that reason, brings in emotional factors which widen in their eyes the zone of unforeseeableness, creating, in short, as Nadel says,[43] artificial risks. With this reservation, Malinowski's theory seems clearly to account both for the fact that archaic peoples do not always trust their positive steps and for the minuteness with which they nevertheless accomplish them—proof that magic is superimposed upon the action as a complement but is not involved in it. Within these precise limits it is certain that, using Dupreel's terms, the B technique can appear as indispensable as the A technique and, in a sense, can facilitate the development of the A technique, because it gives man a greater illusion of security and prevents

39. *Ibid.*, p. 31. See his "Culture," in *Encyclopaedia of the Social Sciences,* IV, 636; *Mœurs et coutumes des Mélanésiens* (Paris: Payot, 1933), p. 144; and *Coral Gardens and Their Magic* (London: Allen & Unwin, 1935), pp. 435–44.

40. E. Dupreel, *Sociologie générale* (Paris: Presses Universitaires de France, 1948), p. 209.

41. Lévy-Bruhl, *L'Expérience mystique et les symboles chez les primitifs* (Paris: Alcan, 1938), p. 53.

42. B. Malinowski, *Argonauts of the Western Pacific* (London: Routledge, 1922), pp. 420–21.

43. S. F. Nadel, "Malinowski on Magic and Religion," in *Man and Culture,* ed. R. Firth (London: Routledge, 1957), p. 193.

him from yielding to discouragement.[44] It is even possible, as Mauss maintained, that magic has in certain cases led to true inventions,[45] but as an adjuvant circumstance and not as a cause. And we must clearly emphasize, on the one hand, that technique does not derive entirely from magic, as Gurvitch specifies,[46] since it develops without recourse to thaumaturgy in those cases in which it appears as directly efficacious, and, on the other hand, that magic is the auxiliary of technique under one alone of its aspects—for black magic would lend itself rather poorly to the optimistic interpretations of Malinowski.[47] Finally, technique, inversely, can arouse the magic appeal by the mystic atmosphere with which we have seen it to be surrounded when it emanates from the skill of the second degree and appears itself as thaumaturgical. Thus smiths often figure as magicians. Here, magic is the reverse of taboo and, like it, derives from the divine-will characteristic of the invention which removes man from his preceding conditioning.

But Malinowski, by disassociating technique from mystic mentality, and Mauss, by deriving it from magic, found themselves in agreement and also joined Frazer in the thought that technique is located on the path leading to science. When we limit ourselves to the observation of archaic societies, this thesis must evidently be posed with modesty. There can be no question of finding an elaborate science in these civilizations. Consequently, Malinowski, after having insisted on all the kinds of knowledge which are implied, for example, in the nautical technique of the Trobriand Islanders, declares that, "if by science be understood a body of conceptions, based on experience and derived from it by logical inference . . . then there is no doubt that even the lowest savage communities have the beginnings of science, however rudimentary."[48] Certainly, he adds, science, among archaic peoples, is not consciously worked out and formulated. But, if we had to conclude

44. O'Reilly, "Notes sur la théorie de la magie et de la religion chez Bergson et chez Malinowski," *Journal de la Société des Océanistes*, December, 1952, pp. 285–86. This writer compares Malinowski's position to the Bergsonian theory which defines magic as a means of insuring one's self against unforeseeablness and of fighting against discouragement.

45. Mauss, *Sociologie et anthropologie*, p. 69. Cf. also Hubert and Mauss, in *Année sociologique, 1902–3*, pp. 144–46.

46. Gurvitch, *op. cit.*, p. 207.

47. This is Nadel's objection (*op. cit.*, p. 194).

48. Malinowski, *Magic, Science and Religion*, p. 34.

from that that it does not exist, then by the same reasoning we should be led to say that these savages know neither law, nor religion, nor government.[49] In a word, his conclusion is clear: "We now know that primitive humanity was aware of the scientific laws of natural process."[50]

Actually, between technique and science there is not only the difference we find between the simple and the complex. The observation of primitive techniques permits this conclusion. Indeed, Malinowski's reasoning is valid only if it can be applied not alone to the practical activity of the Trobriand Islanders but also to all rudimentary technical activity. Now how does this activity, as we see it manifested, for example, in Paleolithic industry, differ from that of certain anthropoid apes? Between the action of flaking a piece of flint to make a Chellian hatchet or of digging up roots with the aid of a previously cut stick and the behavior of a chimpanzee who thins out a piece of bamboo with his teeth in order to fit it into another stick, we could not establish a very clear line of demarcation—unless it lies in the fact that the caveman transmitted his technique to his congeners and made of it a tradition, a basis for later progress. But, if the technical evolution is the result of inventions and traditions, it is by the first of these terms, not the second, that it might contain the embryo of scientific knowledge. Then, if Chellian industry is an implicit science, we have to say as much for that of the chimpanzee. In reality, there is no science which is not explicit science. Technique can utilize laws without a knowledge of the laws being implied. That is what the billiard player does, to go back to a comparison which Lévy-Bruhl has made famous. Goldenweiser aptly writes: "The logic observed in early tools and weapons, traps and snares, pots, houses, and boats, is the logic of nature itself, the logic of the objective relations of things, which through the medium of action, molds the mind so inevitably and smoothly as to be almost wholly unconscious . . . the aim in all of these pursuits is not to know but to do."[51]

Technical inventions can obviously put scholars on the path toward discoveries and new theories, and, inversely, the progress of physics and

49. *Ibid.*, p. 35.

50. Malinowski, *A Scientific Theory of Culture* (Chapel Hill: University of North Carolina Press, 1944), p. 196.

51. A. A. Goldenweiser, *Early Civilization: An Introduction to Anthropology* (New York: F. S. Crofts Co., 1932), p. 406.

of chemistry often carries with it important technical applications. In our time there is a sort of dialectic of progress which makes the techniques and the sciences co-partners, without however taking from them their specific nature, on which Gurvitch insists.[52] But in archaic societies there is no explicit science. Everyone recognizes that. It seems that, on this level, the simple techniques, by their direct efficacy which is apparently without mystery, do not set scientific knowledge in motion and that, if, on the contrary, the complex techniques do lead man to ask himself questions, it is of the religious apologue that he asks his answers.

Thus technique in archaic societies reveals a method, an intellectual step, which already appears in its specificity and at the same time offers two aspects which broadly sketch a binary typology. In a first motion, a technical method which seeks instantaneous and direct effects prolongs the animal impulse. In a second orientation, a method which seeks delayed and indirect effects substitutes organization for aggression by creating, on the one hand, manufacturing techniques of which metallurgy is the highest achievement on the archaic level, and, on the other hand, techniques of acquisition. These develop into cattle-raising and farming and all activities which evolve in an extended time and in whose practice man moves away from animal techniques in order to mold and subjugate nature according to his ends—in sum, to humanize it. But in these two forms technique does not become confounded by its methods with either religion, magic, or science.

52. Until publication of the author's book on the sociology of technical knowledge see Gurvitch, "Wissenssoziologie," in *Die Lehre von der Gesellschaft,* ed. Eisermann Stuttgart: Enke, 1958, pp. 433–34.

BOOK REVIEWS

Irving Louis Horowitz

Isaac Newton's Papers and Letters on Natural Philosophy and Related Documents

Edited by I. BERNARD COHEN
(Cambridge: Harvard University Press, 1958.) Pp. 501.

Science and Religion in Seventeenth Century England

By RICHARD S. WESTFALL
(New Haven, Conn.: Yale University Press, 1958.) Pp. 235.

It is a great pleasure to report the publication of two such fine complementary volumes. It should be immediately said that they are of fundamental importance in the comprehension of Newton and his century. Their precise common virtue is to continue the work of Herbert Butterfield, G. N. Clark, Robert Merton, and B. Hessen in focusing attention on the tangled web of intelligence and ideology such as it existed in seventeenth-century England. Both the Westfall dissertation and the essays in *Newton's Papers* by I. Bernard Cohen, Thomas S. Kuhn, Marie Boas, Perry Miller, Robert Schofield, and, above all, the brilliant paper of Charles C. Gillispie of Fontenelle's biography of Newton serve as healthy antidotes to the anthropomorphism that riddles much work on Newton.

Whether Newton was *ultimately* the leading figure in the struggle be-

tween science and religion or *ultimately* the conservative showing how belief in natural religion inspires the direction of physical research is an interesting puzzle. However, such a perspective tells us more about twentieth-century attitudes than the actual context in which Newton operated. The divide between history and metaphysics has been transgressed in this sphere more than is either necessary or desirable. Of Newton it might well be said that the poets praised him, the scientists prized him, while the philosophers of English Anglicanism made a mystery of him.

Westfall's study of the virtuosi (those Englishmen who had both a general interest in science and a specific area of empirical pursuit) and Cohen's general introduction to *Newton's Papers* show an essential dualism throughout the century between the empirical requirements of natural science and the social and psychological attachments for revealed religion. What marks Newton off from the rest of the virtuosi is the fact that, although he was son to the great dualism, he was no less father to the Enlightenment efforts to cope with and overcome this split between matter and spirit.

The worth of the Westfall volume largely resides in its examination of the constituent parts of this dualism. The virtuosi (John Ray, Thomas Sprat, Robert Boyle, Walter Charleton, Joseph Glanvill, Robert Hooke, and Isaac Newton) inherited the religious attitude of wonder toward nature and yet worked mightily to explain and thus remove wonder from nature. They had a shared indebtedness to Epicurean atomism and yet had to deny the Epicurean ethical and social teachings that made the ancient a unified theorist. They insisted that scientific reason was the surest proof of religious belief and yet remained reticent to allow revealed religion to stand in judgment of natural science. All believed in an omnipotent God and then assigned him to impotence by making him a mechanical force. Tradition adds a wry note, since it was even whispered that God was really to be found in the propositions of Newton's *Principia*. These polarities underscore the shakiness of the union of rationalistic faith and empirical discovery.

These volumes call attention to the essentially conservative social views of the virtuosi. The more shaky the theoretical pinnings, the more desperate the statements of dedication to theism. This is apparent even in the titles of the virtuosi non-scientific works: Charleton's *The Darkness of Atheism Dispelled by the Light of Nature*, Boyle's *The Excellency of Theology*, and Glanvill's *A Blow at Modern Sadducism*. Even Newton gave open support to Bentley's *A Confutation of Atheism*. To account for the religious bent of leading scientific figures of seventeenth-century England is the task of Westfall's book and of Perry Miller's essay. The answers are roughly along three lines. The first is the essential social mid-

dle-ground position, which led the virtuosi to fear the revolutionary potential of the "enthusiasts" no less than the "atheists." The rational religion, like the rational science, was to be thoughtful and reflective. Religious pietism was to entail social quietism. The second factor was the Anglican upbringing which informed the ideology of the life of the scientist gentleman. The third, and perhaps the decisive, element is the forebodings the knowing virtuoso must have had as to the consequences of mechanical science. Would the next age approach science as self-sufficient and ignore the teleological proofs or providential rule? As Westfall indicates, the virtuosi "wrote to refute atheism, but where were the atheists? The virtuosi nourished the atheists within their own minds. Atheism was the vague feeling of uncertainty which their studies had raised, not uncertainty of their own convictions so much as uncertainty of the ultimate conclusions that might lie hidden in the principles of natural science."

Newton's relation to this tradition was the crowning contradiction. He made it easier for the Enlightenment to exclaim of the virtuosi natural theology: "Look, the king has no throne." Westfall and Miller do much to dispel the myth of Newton's mysticism by citing the texts to show that Newton did not join the other virtuosi in their anti-atheistic clamor. He left the all-important issue of material or immaterial "agents" open to individual judgment. Indeed, Newton noted that "contradictious phrases" may be due to actual paradoxes in nature and that the search for metaphysical certainty was a moral rather than a scientific requirement. In this, Newton was closer to Hume than to theism.

Thus whether the world harmonies postulated by theology were or were not original sources for the general theory of gravity pales in significance next to the fact that the actual consequence of Newtonian science was materialistic—verifying the private fears of the virtuosi and the exclamations of the outright enemies of natural philosophy. It is a historical truth that Newton's broadening-out of Christianity into natural religion was but a moment in time away from a frank avowal of naturalism without religion. This is the transformation effected by Voltaire and French deism. Neither the original doucments nor the critical analysis lead to any other conclusion.

The most serious shortcoming in this edition of *Newton's Papers* is the disastrous consequences of a facsimile edition. We are confronted with a mélange of types. Some of the type faces are difficult enough to read in the original, but, given the natural "bleeding" effect of offset photography, examining the manuscripts becomes a formidable effort for even a hardened bibliophile. When we have innumerable editions, as in the Shakespeare works, then a facsimile edition for collectors has meaning.

But what justification can be found in this case, where the Newton papers are gathered for the first time, is beyond the reviewer's comprehension. Library sponsorship for this volume should not have necessitated fossilized attitudes. Finally, if so many pages can be given over to selections from Bentley's *A Confutation of Atheism,* then at least one of the lesser-known drafts of Newton's own work on religion, *Irenicum,* might have been included. Nonetheless, this volume is sure to take its place beside the *Principia* and the *Optiks* as a guide to understanding the scope of Newton's efforts.

The objection to the Westfall study is of mere consequential nature. It involves the difference between competence and creation. The total spectrum of religious-philosophic thought involves not only the Anglican orthodoxy and the virtuosi heresy but the atheist perspective as well. Specifically, it must include the relation of the virtuosi to Thomas Hobbes. Westfall's statements on this score are paradoxical. His stated reasons for not dealing with Hobbes are unconvincing. Neither the singularity of Hobbes's views nor the idea that "he would require a volume by himself" can be seriously defended, since the first objection is precisely what makes Hobbes interesting, and the latter objection characterizes nearly all the virtuosi. Nor does the failure of the Royal Society to propose him for membership rule out Hobbes, since, contrary to Westfall's statements on an absence of concern for the activities of the Royal Society, Hobbes did indeed evince great concern—as evidenced by the frequency with which he submitted scientific papers and demonstrations. The Royal Society's failure to consider him for membership was unquestionably a cause in Hobbes's disdain for a scientific society that gave little attention to the fundamental theory of motion and too much time to artifacts and contraptions. Westfall is compelled to violate his reasoning on several occasions in order to explain the heat with which many of the virtuosi attacked atheism. It was not so much their feelings of guilt as a response to the threat of the "Hobbists," whom the virtuosi assured everyone were as evil as atheists and Sadducees. The examination of Hobbes's role in relation to the scientific and religious currents of the seventeenth century remains a work to be done. We can, as a result of Westfall's study, at least see what the other operative philosophies included and excluded. What alterations would be made necessary in his thesis about the religious consciousness of the virtuosi involves the further investigation of a naturalistic alternative in the midst of an attempt at a theistic-scientific synthesis.

Notes on the Contributors

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The symbol in music—its origin, analysis, and interpretation—is the concern of MARIUS SCHNEIDER, born in Hagenow, Alsace, in 1903. A student of philology, musicology, and folklore, he took his Doctor's degree in the field of fourteenth-century music and in 1933 became director of the archives at the Psychology Institute of the University of Berlin. When his university work was interrupted by the political regime, he devoted himself to research and eventually accepted a call to the headship of the folklore division at the Insti-

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HILDEBERT ISNARD, professor at the Faculté des Lettres et Sciences Humaines of the University of Aix-en-Provence, makes a valuable contribution toward our understanding of the Algerian political and social structure. A specialist in the geography of North Africa and tropical lands in general, he has published *La Culture des primeurs sur le littoral algérois et ses conditions géographiques* (Alger: Carbonel, 1935); *L'Organisation de la propriété rurale dans la Mitidja (1851–1867): Consequences sur vie des indigènes* (Alger: Imprimerie Joyeux, 1949); *La Vigne en Algérie: Étude géographique* (2 vols.; Gap: Ophrys, 1951–54); *L'Algérie* (Paris: Arthaud, 1954); and *Madagascar* (Paris: A. Colin, 1955).

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The English-language edition of *Diogenes* is sponsored by Mr. and Mrs. J. de Ménil, Houston, Texas.